VOL. II

ber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

3. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

4. The device of claim 1 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

5. The device of claim 1 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

ELIE AGHNIDES.

Plaintiff's Exhibit 12 (p. 2 App. 6 in Plane)

April 20, 1943. E. AGHNIDES 2,316,832

FLUID MIXING DEVICE

Filed April 5, 1940

FIG. 1.

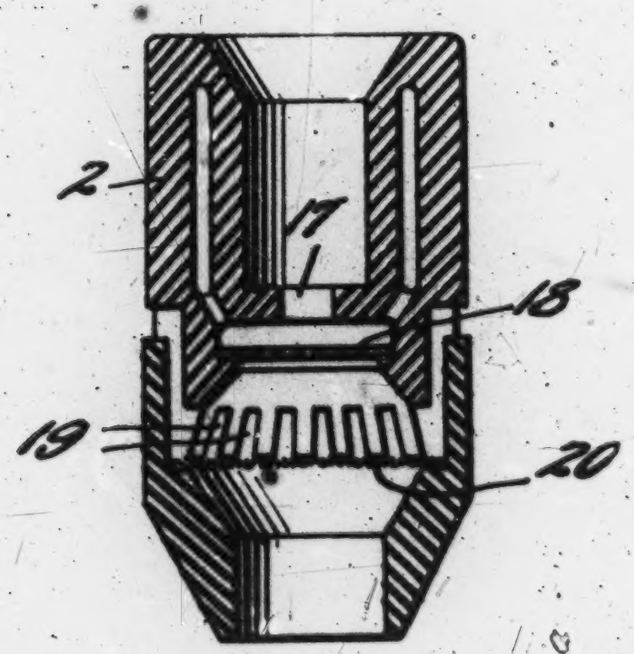


FIG. 2.

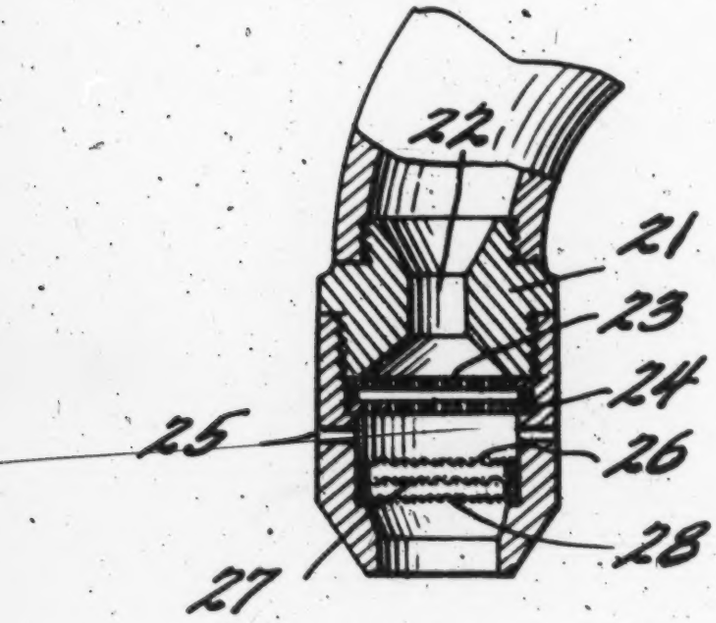
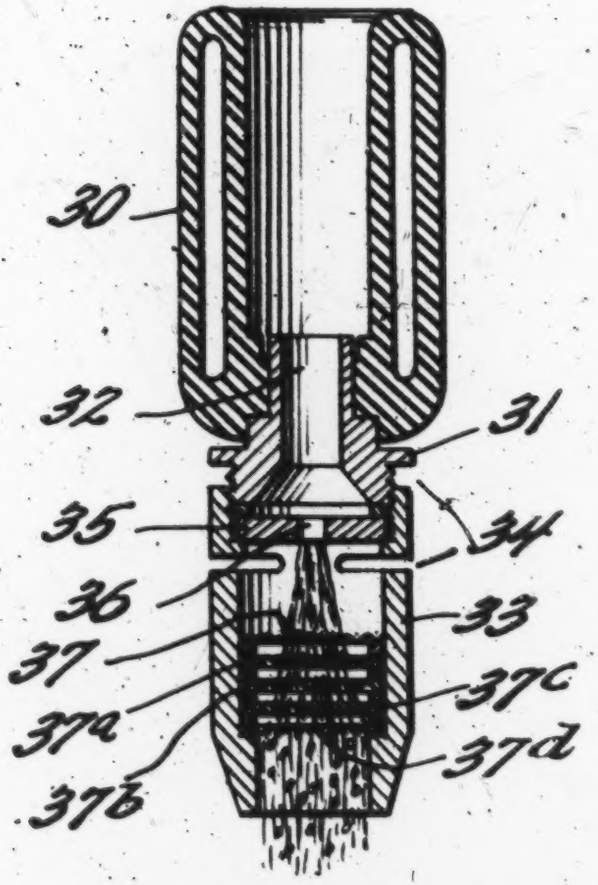


FIG. 3.



Inventor

Elie Aghnides,

By John Boyle Jr.

Attorney

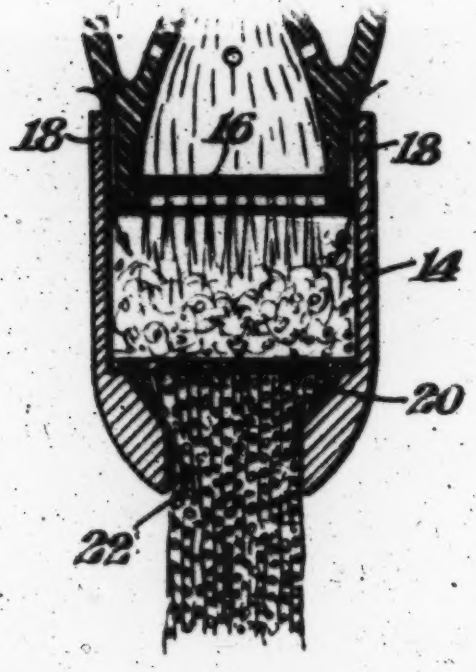
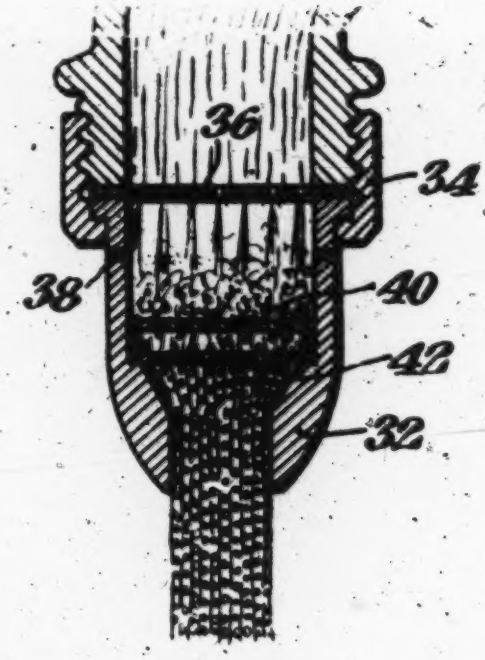


Fig. 3.



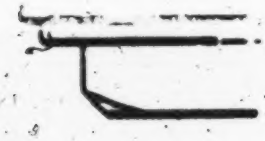


Fig. 8.

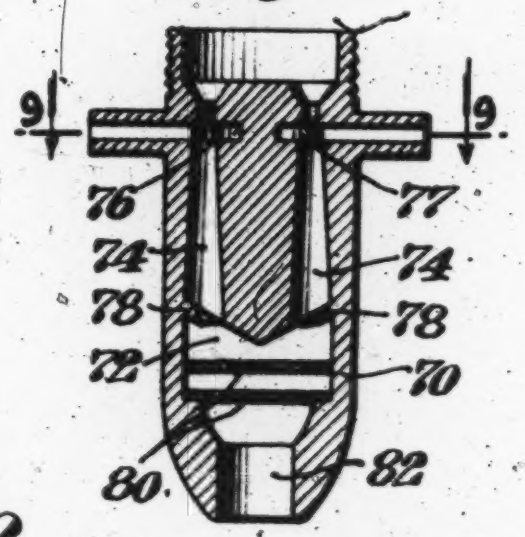


Fig. 2.

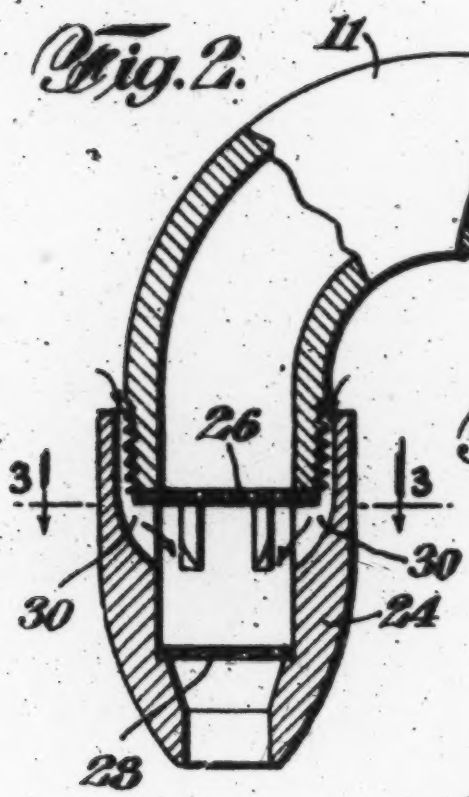


Fig. 2.

Fig. 9.

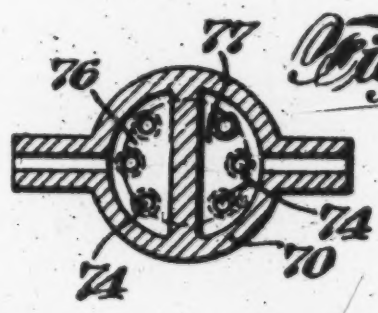
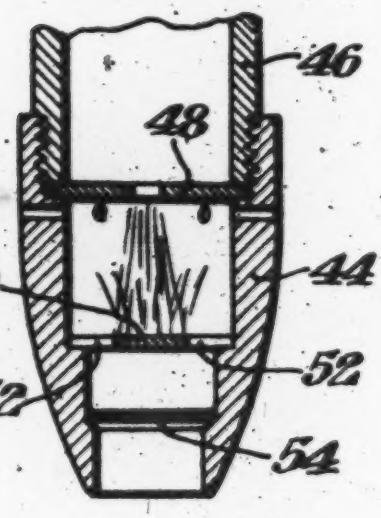


Fig. 5.



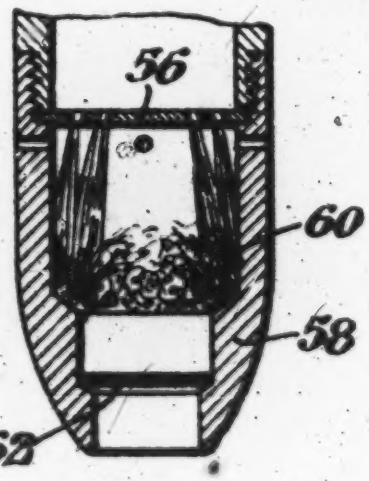


Fig. 6.

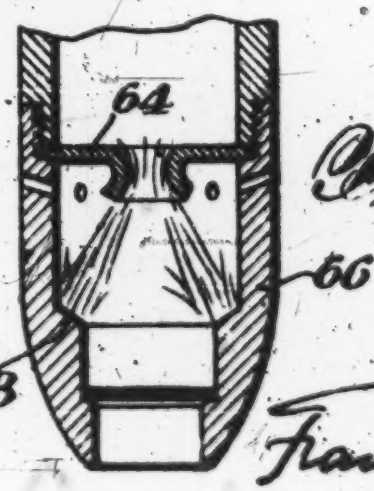


Fig. 7.

INVENTOR,
Elie Aghnides,
BY
Frank S. Ackerman,
ATTORNEY.

Plaintiff's Exhibit 12

(2 App. 8 is Blank)

2 App. 9

UNITED STATES PATENT OFFICE

2,316,832

FLUID MIXING DEVICE

Elie Aghnides, New York, N. Y.

Application April 5, 1940, Serial No. 328,126
In Belgium December 4, 1934

4 Claims. (Cl. 261—76)

My invention relates to a device for intimately mixing a large volume of a gas, such as air, with a liquid such as water, and ordinarily is used for producing a jet of water containing air bubbles disseminated throughout the jet and is an improvement on my Patent 2,210,846 granted Aug. 6, 1940. Such a jet is whitish in appearance, soft and light to the touch and possesses numerous advantages not found in the ordinary water jet as discharged from a faucet.

Generally speaking, my invention consists therefore of a device comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube, such as an ordinary household water faucet, containing water under the normal main pressure of about 3 atmospheres. The outlet end of the device is adapted to discharge a coherent jet containing air bubbles disseminated throughout the jet. At the upstream end of the chamber is an apertured diaphragm through which the stream of water is adapted to be forced into the chamber with substantial velocity. An air port opening into the chamber is provided through which air is induced by the stream of water. At least one foraminous screen is provided in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end, for finely breaking up the stream of water which is thoroughly mixed with the air.

Means are provided for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet. This may be in part, a multiplicity of orifices in the upstream diaphragm; or in the addition of at least a second foraminous screen between the first screen and the outlet end, with openings so close to each other that the issuing aerated water unites to form a coherent jet; or, in the addition of a tubular portion at the outlet end and adapted to contract the stream of aerated water issuing from the screen, to form a coherent jet.

Referring to the drawing

Fig. 1 is a vertical section of one form of my invention.

Figs. 2 and 3 are similar sections of modified forms.

In Fig. 1, I employ the same type of rubber tap connector 2 as in Fig. 1 of my aforesaid patent, except that I provide a constricted orifice 17, above the upstream apertured diaphragm 18, and the air inlets 19 terminate close to the surface of the downstream screen 20.

In Fig. 2, I employ a screw coupling 21 having a restricted orifice 22 for connecting my device to a faucet and I employ two spaced apertured diaphragms 23, 24 located above the air inlets 25 and I use three spaced screens 26, 27, 28, in the downstream end of the device.

In Fig. 3, I employ the same general type of rubber tap connector 30 as in Fig. 1. The metal coupling 31 having a restricted orifice 32 is secured thereto. Screwed to the coupling is the lower portion 33, provided with air inlets 34, an upstream diaphragm 35 having a single orifice 36 and five spaced wire screens 37, 37*a*, 37*b*, 37*c*, and 37*d*. The number of screens used depends on the orifice area, the distance between the diaphragm and screens and the mesh of the wire screens.

I have found that when the water is discharged through a restricted orifice, as at 17, Fig. 1, at 22 Fig. 2, and at 32 Fig. 6 that the flow through the orifices in the upstream diaphragm is improved and a more regular and softer jet is delivered from the outlet end of the device.

A similar result is obtained when instead of the restricted orifice upstream of the diaphragm, a second foraminous diaphragm as 23, Fig. 2, preferably with greater aggregate cross section of the foramina, is located upstream of the first diaphragm 24, at a distance of about 1 mm. Both the restricted orifice and the second diaphragm can be used together for a more uniform flow of the bubbly jet.

This application is a continuation in part of my applications Ser. No. 182,884 filed Dec. 31, 1937 patented August 6, 1940, Number 2,210,846 and Ser. No. 52,923 filed Dec. 4, 1935.

I claim:

1. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

2. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the

Plaintiff's Exhibit 12

outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice upstream the apertured diaphragm.

3. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice and foraminous member upstream the apertured diaphragm.

4. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, superposed apertured diaphragms at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragms and means in the path of the stream of water after it leaves the apertured diaphragms and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles.

ELIE AGHNIDES.

Plaintiff's Exhibit 13 2 App. 11

Ministère de l'Industrie,
des Classes Moyennes et du Commerce
Intérieur

Direction Générale de l'Industrie

SERVICE
DE LA PROPRIÉTÉ INDUSTRIELLE

N° 406.702

ROYAUME DE BELGIQUE

3041 Ex 13

BREVET D'INVENTION

Le Ministre des Affaires Économiques
~~Le Ministre de l'Industrie, des Classes Moyennes et du Commerce Intérieur,~~

Vu la loi du 24 mai 1854 ;

Vu le procès-verbal dressé le 8 décembre 1934, à 11 h 50',

au Greffe du Gouvernement provincial du Brabant ;

ARRÊTÉ :

Article 1er — *Il est délivré à* Mr E. Aghnidis,
16, rue Capouillet, à Bruxelles,
repr. par Mrs Jeunehomme & Delbrouck, à Bruxelles

Article 1er — *Il est délivré à* Mr E. Aghnidis,
16, rue Capouillet, à Bruxelles,
repr. par Mrs Jeunehomme & Delbrouck, à Bruxelles

un brevet d'invention pour : Dispositif pour mélanger de l'air à une colonne de fluide sous pression en circulation.

Article 2. — *Ce brevet lui est délivré sans examen préalable, à ses risques et périls, sans garantie soit de la réalité, de la nouveauté ou du mérite de l'invention, soit de l'exactitude de la description, et sans préjudice du droit des tiers.*

Au présent arrêté demeurera joint un des doubles de la spécification de l'invention (mémoire descriptif et dessins) signés par l'intéressé et déposés à l'appui de sa demande de brevet.

Bruxelles, le 31 janvier 1935.

Pour le Ministre et par délégation :
Le Directeur, Chef de Service,
[illegible]
LE DIRECTEUR GÉNÉRAL

Plaintiff's Exhibit 13

2

Fig. 1

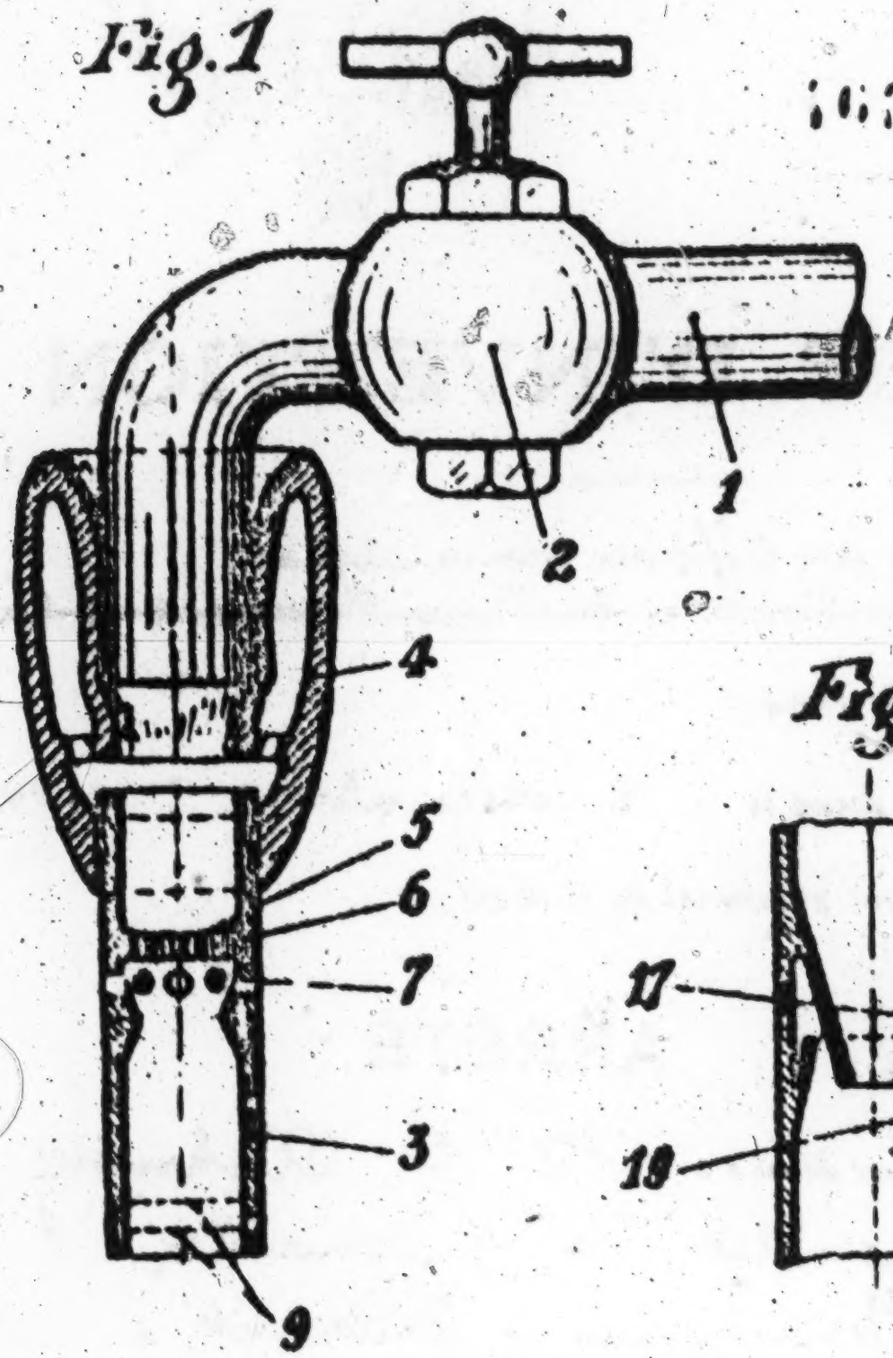
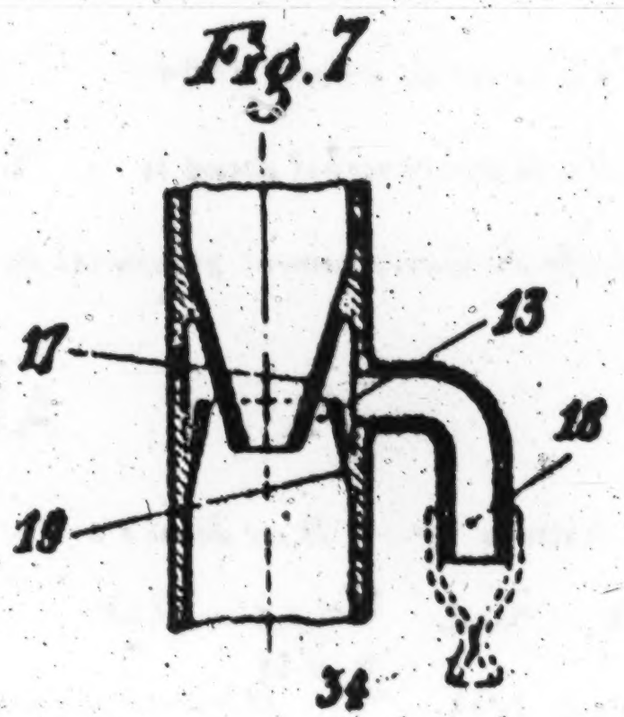


Fig. 7



This process can be realized in different ways and permits for certain applications such as the water softening installations, and noticeable simplification of said installations.

In a non-limitative series or examples, the drawings represent:

Figure 1, axial section of a device of water aerator in a domestic conduit.

Figure 2 to 5, several schematic realizations of variants.

Figure 6 is a schematic view of an installation (domestic or other) for the treatment of fluids, for instance, water softening; and

Figure 7 is an enlarged view of the aerator of Figure 6.

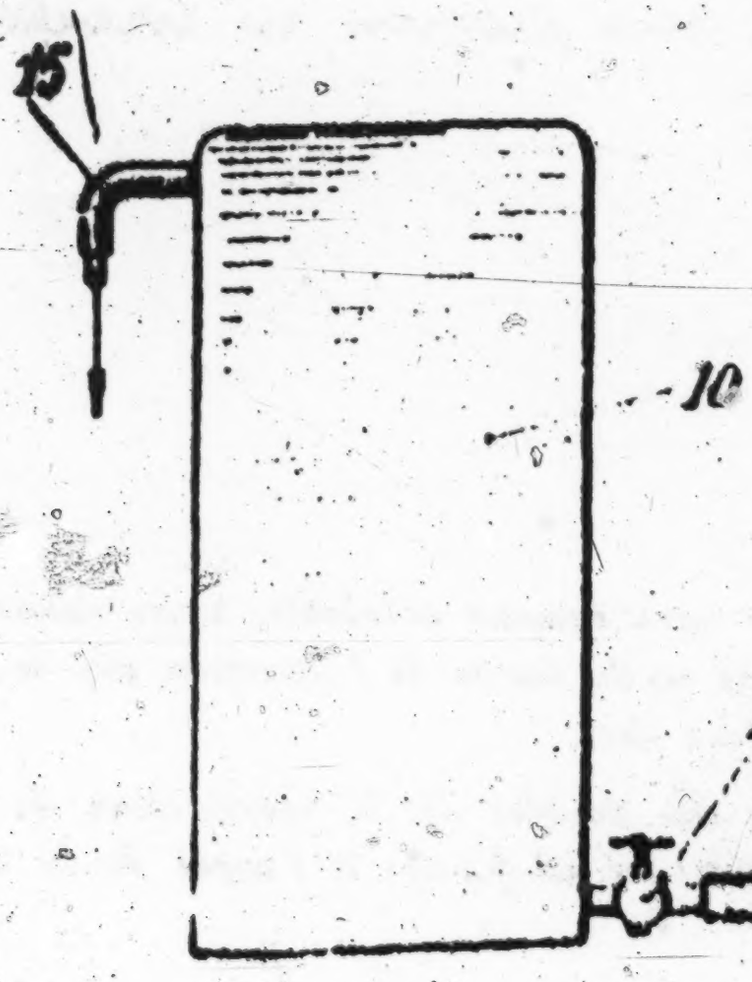
Figure 8 is a variant of Figure 6.

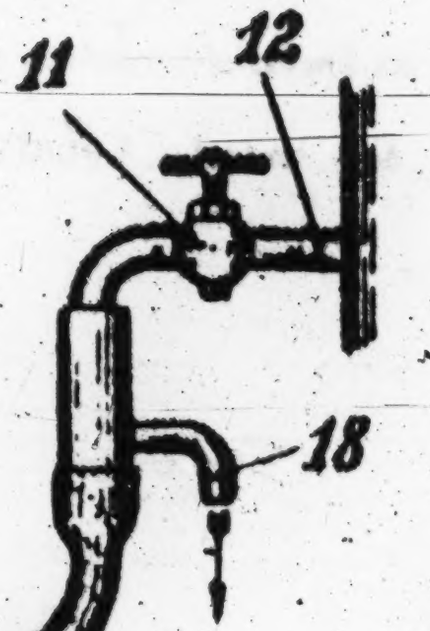
In Figure 1, 1 is a pipe of water under pressure, for instance, and 2 is a faucet of any type. At the spout end of the faucet is attached a tubular member 3; the assembly can be done in any manner providing it is watertight, and in the example shown it is realized by a special tap connector 4 known as self-locking. The tubular member is closed inside by a transversal wall 5 pierced with holes 6, the purpose of which is to divide the water under pressure in order to increase the surface of contact between the water and the air; the total cross section of the holes 6 is smaller than the total cross section of the spout and of the faucet. Downstream the wall 5, the lateral wall of the tube 3 is pierced with a crown of holes 7, the diameter of said crown being necessarily bigger than the diameter of the total cross section of holes 6. The function is easily understood. 9 designates schematically two sieves or dividers of any type with a view to create one or more chambers and insure the homogeneousness of the mixture before it is discharged.

3

The wall 5 can offer a total section of flow equal to that of the conduit downstream (Figure 5). Likewise, the holes 7 can be replaced by a complete interruption of the tubular wall, as shown in Figures 2 to 5. In Figure 2 the conduit downstream 20, larger than the conduit upstream, terminates opposite to it by a convergant-divergant part 21. In Figure 3, it is multiple and comprises several crowns at different levels for the admission of air; in Figure 4 which corresponds to Figure 3, the two conduits the one upstream and the other downstream, are united by a collar 23 permitting the passage of air.

Fig.6





Note

Pages 13–14 not present; no other copy of Record is available

In Figures 6 and 7, 10 designates a known apparatus which is intended to soften the water traversing said apparatus; such a type of water softener is of course well known. The use of these water softeners is expanding more and more in the domestic economy; they are connected simply to the spout end of the faucet 11 of the conduit 12 carrying hard water. Up to now, however, these installations had a shortcoming; the connection between the softening reservoir 10 and the faucet 11 is made by a flexible rubber hose 14 and between said flexible hose and the faucet 11 one has to insert a faucet with three outlets, the handling of which permits the water coming from 11 or the water coming through the water softener and discharging through 15, or deviated by the faucet with three outlets, for being used as such without softening. These faucets with three outlets are relatively expensive to make and are not always watertight; moreover, they move too often the rubber top connectors during the operation.

4 According to the invention, the faucet with three outlets is done away with and replaced by a simple faucet 16 directly mounted on the water softener 10. To the faucet 11 the device shown by Figure 7 is attached and corresponds to that of Figure 1, with the difference that the slots or crown of holes are formed in a circular chamber by a pipe 18. In Figure 7, the wall 5 is eliminated, as a variant; the converging conduit 17 opens in the diverging conduit 19 which is connected with a flexible hose 14 which itself is connected to the faucet 16. Between the two conduits 17-19, exists a free crown 13 communicating with the end 18 for the admission of the air aspired by the column of liquid.

When the two faucets 11 and 16 are opened, the water passes through the reservoir 10 where said water arrives charged with air; the faucet 16 being closed, the water is discharged through 18 hard as it is.

For the same application, one can provide the device of Figure 8 which permits not only to send aerated fluid towards the water softener 10, but also to obtain directly aerated water when the faucet 16 is closed. In this arrangement of Figure 8, in which the rubber connector 25 is mounted directly at the spout 10 of the faucet 11, the pipe carrying the water under pressure 26, opens in the chamber 27 which is open, on the one hand on the

pipe 28 and closed, on the other hand on the pipe 29. The first pipe is intended to receive the flexible hose 14, and is provided with a wall 30 perforated (corresponding to the wall 5 of figure 1) and holes 31 for the admission of air which open on the pipe 29. This latter is inside in a convergent-divergent conical form, with a crown of holes 32 for the admission of air at the place where the cones meet. The diverging part of this pipe is provided with dividers 33.

The two faucets 11 and 16 open, the liquid tends to pass through the conduit of lesser resistance, therefore through the conduit 14; as a result a strong suction is created in 29, the air passing through the holes 32 and from there through the holes 31. If the faucet 11 alone is open, the liquid flows through 31 to 29, entraining air through the holes 32.

In the device of Figure 6, one can provide, at the end 18, a tube 34 in very soft rubber, and which is mounted at this end, for special reasons, it is not desirable that the fluid passing through 10 be mixed with air; thanks to the vacuum created in 18 by the flow of the fluid toward 14, the flexible hose closes automatically. It is understood that the examples given here are not limitative and have for purpose to show the application of the process in general; everything that has been shown for the conduits of water applies to conduits of fluid under pressure in circulation, continuous or intermittant.

CLAIMS.

1. A device for mixing air to a column of liquid under pressure in circulation, comprising in combination an air port in the column and the means downstream of said air-port for obliging the air entrained to mix with the fluid under pressure, the section of the conduit at the point of said air duct and the section of the conduit immediately downstream of said air duct being larger than the total free section immediately upstream.

2. A device according to claim 1 characterized in that said means is formed by one or more baffles located in the downstream part of the device.

3. A device according to claim 1 characterized in that said means is formed by a prolongation of the downstream part of the device.

4. A device according to claim 1. characterized in that the column of fluid is divided, immediately upstream said air duct, for instance, by a perforated transversal partition.

5. For a device according to claim 1, a connector provided with an air port, an upstream end adapted to be connected to a pipe of fluid under pressure, a downstream end provided with means for effecting the mixture of the fluid under pressure and of the air entrained, the section of said connector at the point where is the air port and the section of the part immediately downstream being larger than the section of the part immediately upstream.

6. A device according to claim 5, characterized by the fact that it comprises many air ports at different levels.

7. A device of a connector according to claim 5, characterized in that the air port is formed by a pipe.

8. A device of claim 7, characterized in that said pipe is adapted to be closed automatically by the depression created in the connector during the flow of liquid under pressure.

7 9. A device according to claim 7 characterized in that said pipe is provided also with an air port, with parts upstream and downstream, according to claim 5.

10. An installation of the treatment of fluid under pressure in circulation, comprising an apparatus for said treatment provided with a faucet at the entrance or at the outlet, said apparatus being connected at the entrance, to a device according to claim 7 or 8 or 9 so that by closing said faucet fluid not treated will flow through the pipe of said connector, said apparatus forming at the same time a means for mixing the air entrained and the fluid under pressure according to claim 1.

11. An installation according to claim 10 characterized in that the apparatus for treatment is a water softener or a filter or a sterilizer, connected by a connector according to claim 7, 8 or 9, to a faucet, of the fluid under pressure, which permits, by the handling of the faucet, of the water softener, to obtain water simply aerated by the pipe of the connector, or to let the water flow, aerated or not, by this apparatus.

PLAINTIFF'S EXHIBIT NO. 15 2 App. 19

NUMBER (Series of 1935)

52923

DIV. 3932

PATENT NO.

1935 DATED

(EX'R'S BOOK)

Name ELIE AGHNIDES

of BRUSSELS

~~State of~~ BELGIUM

Invention FLUID MIXING DEVICES IN WHICH ONE OF THE FLUIDS IS UNDER PRESSURE

ORIGINAL

APPLICATION FILED COMPLETE DEC 4 , 1935

IF APPLICATION FILED

Petition, Specification, Oath, First Fee $30, 1 sheets Drawings; DEC 4 1935

RENEWED

This application referred to in Patent No. 2,210,846. Do not destroy. (See order No. 3166, 400 O.G. 1)

ORIGINAL

RENEWED

APPLICATION FILED COMPLETE DEC 4 , 1935

PARTS OF APPLICATION FILED

Petition, Specification,
Oath, First Fee $30,
1 sheets Drawings,

DEC 4 1935

This application referred to in Patent No. 2,210,846.
Do not destroy. (See order No. 3166, 400 O.G. 1)

DO NOT DETACH

Examined and passed for Issue , 193

Exr. Div.

Notice of Allowance , 193
By Commissioner.

Final Fee , 193

Reexam'd and passed for Issue , 193

Exr. Div.

Notice of Allowance , 193
By Commissioner.

Final Fee , 193

Division of App., No.

Attorney FRANK S. APPLEMAN 1331 G ST N W CITY.

Associate Attorney

No. of Claims Allowed *Print Claims* *in O.G. Class*

Title as allowed

BELGIUM DEC 8 1934

1

Etats-Unis De L'Amerique Du Nord
Ver. Staaten Von N. Amerika
(Division XXXII U. S. Patent Office Dec 12 1935)

PETITION.

U. S. Patent Office Dec. 12 1935 Division XXXII.

To the Commissioner Of Patents

Your Petitioner Elie Aghnides, a citizen of the Greek Republic, and resident of Brussels, Belgium, whose post-office address is: 54, rue Capouillet, Brussels, Belgium, prays that Letters Patent may be granted to him for the Improvements in Fluid mixing devices in which one of the fluids is under pressure. set forth in the annexed Specification, and he hereby appoints Frank S. Appleman, 1331 G. Street, N. W. Washington, D. C. his Attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the Patent, and to transact all business in the Patent Office connected therewith.

Signed at Brussels, Belgium, Nov. 23, 1935.

Inventor Elie Aghnides

2 TO ALL WHOM IT MAY CONCERN:

Be it known that I, Elie Aghnides, a citizen of the Greek Republic and resident of Brussels, Belgium, have invented certain new and useful Improvements in Fluid mixing devices in which one of the fluids is under pressure, of which the following is a specification:

This invention relates to a device for intimately mixing at least two fluids one of which is under pressure.

According to a general *embodiment of the invention*, ~~but not limiting case~~, atmospheric or surrounding air is intimately mixed *with* to a circulating water column under pressure to *form at true water and air emulsion* ~~obtain~~ at the outlet of the device; ~~a true water and air emulsion~~. The mixture thus obtained possesses remarkable qualities: the water thus charged with oxygen and carbon dioxide from the air, acquires an agreeable flavour, like water coming from a natural spring; (this water is more *digestible* ~~digestive~~, it softens the skin and due to the simultaneous and automatic introduction of *emulsified air* ~~emulsed air~~ and water *and forms* ~~realises with soap~~ a very foamy emulsion *with soap* which means

better washing and a *real* ~~serious~~ economy of soap and time, for instance when washing clothes. The enriching of the water in oxygen and carbon dioxide, *gives* ~~confers to~~ the water a higher exodizing power and *causes* ~~realises~~ an ionisation of the water which renders it more active.

Another *practical* ~~pratical~~ application *of the invention occurs,* ~~consists~~ for instance, in drawing off beer. Repeated experiments have proved that beer drawn off by means of carbon dioxide under pressure and ~~compelled to~~ run through the device *of* ~~according to~~ the invention to be *thereby* intimately mixed with the surrounding air, acquires a better taste and a finer appearance, the foam being more *lasting* ~~resistant~~.

This invention *includes* ~~compsises~~ all the *instances* ~~cases~~ in which one or more fluids (gas or liquid) have to be mixed to a circulating liquid column under pressure.

3 The device according to the invention comprises essentially, in combination, a cylindrical hollow body part which can be adapted to a fluid pipe under pressure, a passage in the wall of said body for entrance of another fluid in said body, by the aspiration caused by the passage of the fluid under pressure, *through the device* and *of* means below said passage, to force the fluid drawn in to mix with the fluid under pressure; *The* ~~the~~ cross section of said body at said passage and the *cross* section immediately below said passage being larger than the total free section through which the fluid flows immediately above said passage.

According to an embodiment for mixing the surrounding air to a column of liquid under pressure, the passage or passages for the entrance of air may be formed by a ring of holes or slits in the walls of the tube or by an interruption in the wall, either with the part above said passage *being contracted at its lower end,* ~~which contracts itself~~ and *extending into* ~~eventually enters in~~ the part below, or *from* with the part below *being widened at the top to receive the lower end of the part above* ~~provided with a widening at the entrance~~ or ~~still~~ with the part above *being* of a smaller diameter than the part below said passage *and extending therein.*

The passage of the fluid under pressure, either at normal speed or at an artificially increased speed, creates a suction *and draws* air through said slits or holes *which*

~~and this air~~ is drawn away by and mixed to the fluid under pressure in the pipe below said passage, ~~provided to that end, with~~ *by means of* one or several dividing devices or baffles *provided for this purpose.*

This process can be carried into effect in various manners and *by various means* ~~in certain cases or applications~~ such as water softening devices *wherein it acts to* ~~it contributes to considerably~~ simplify the plant *considerably.*

In the drawings:

Fig. ~~Fig.~~ 1 is a *vertical and* axial cross-section of a water aerating device for a domestic water pipe.

Figs. ~~figs.~~ 2 to 5 *inclusive are vertical axial sections of modifications of the aerating device of Fig. 1,* ~~relate to various diagrammatic realizations.~~

Fig. 6 is a diagrammatic view of a domestic or other plant for treating fluids, for instance for water softening.

4 *F*~~f~~ig. 7 is a ~~cross section~~ *vertical axial section on* at an enlarged scale, of the aerating device shown in *F*~~f~~igure 6.

F~~f~~ig. 8 is a *an axial vertical section of a further modification* ~~cross section through a modified form~~ adapted to mix three fluids and

F~~f~~ig. 9 is a transversal cross section along line IX-IX of *F*~~f~~igure 8.

In *F*~~f~~igure 1, the numeral 1 indicates ~~for instance~~ a water pipe under pressure and 2 a tap of any type whatever. A tubular part 3 is fixed at the end of the tap; the connection can be made in any desired manner provided that it is tight, and in the example *shown comprise* ~~this is realized by means of~~ a special self tightening fitting 4 of a known kind.

The tubular part 3 is provided *with* ~~and closed inside by means of~~ *an internal transverse* ~~a transversal partition~~ 5 provided with holes 6 the object of which is to divide the current of water to increase *air* contacting surface *thereof. The* ~~between the water and the air, the~~ total section or surface of the holes is smaller than the section through which the fluid flows at the end of the tap. *Below* ~~Above~~ the partition 5, ~~in respect to the current of water,~~ the side wall of the tube 3 is provided with a ring of holes 7, the diameter of *the total section of said holes 7*

of said ring being necessarily larger than the diameter of the total section of *said* holes 6.

~~The manner in which the device works will be immediately understood.~~

Numeral 9 represents diagrammatically two perforated plates *or* ~~of~~ any other dividing devices, to *form* ~~realize~~ one or several chambers or spaces *to insure* ~~ensuring~~ uniformity in the mixture before its exit.

The partition 5 may have a *diameter* ~~total section of passage~~ equal to that of the pipe below (*Fig.* 5). ~~in respect to the current of water. In the same way, the~~ *The* holes 7 may be replaced by a complete interruption of the tubular wall as is the case in *Figures* 2 to 5. *inclusive.*

In *Figure* 2, the *lower* ~~upper~~ pipe 20, which is larger than the pipe *20a above* ~~below,~~ comes to an end in front of the latter in the form of a contracting-expanding *air venture* part 21. In *Figure* 3, the device ~~is manifold and~~ comprises several stepped *and funnel mouthed* air admission rings, ~~and in figure~~ *Figure* 4 ~~which corresponds to figure 3, the piping above and the piping below are jointed by a slip or by means of flanges 23 allowing the air to pass.~~

The device shown *Figure Fig* 8 and 9 is adapted to mix three fluids, only one of which is under pressure. This device can be absolutely identical to the devices shown in *any of* the first named figures provided that *at least one hole corresponding to* ~~of one part of~~ *one of* holes 7 *of Fig. 1 is connected* ~~is in relation~~ with a tank or container *containing* ~~comprising~~ one fluid, and the other *corresponding holes are connected* ~~part in relation~~ with another container *containing* ~~comprising~~ another fluid. *T*hose two fluids will be sucked up at the same time by the fluid column under pressure and will *be mixed* ~~mix~~ with it, *by* ~~thanks to~~ the dividing *wall* ~~rift~~ 9.

In the example shown, however, the wall of the body 3^a is provided with two diametrically opposed ducts 35-36, ~~each of which is connected with a container or space~~ (not shown) containing a fluid to be mixed to the fluid under pressure. *Each* ~~In each~~ duct opens in the interior of the body 3^a *through* ~~a port 7'~~ in the wall of the latter.

~~On a certain~~ *The upper* part of ~~its length~~, the body 3^a, is ~~of~~ solid ~~nature,~~ *and is provided with* ~~through~~ this solid

part, longitudinal holes 37 of expanding cross-section *in a downward direction* ~~are pierced~~, in order to divide the fluid under pressure into a number of streams which exert a suction through *the ducts 25 and 31A* ~~ports 7'~~, a diametrical partition 38 is also provided at the level where the ducts 35-36 open *into* ~~in~~ the body 3^a, and at this point, the body 3^a, ~~is flowed~~, in order to form two separate compartments 39-40 at each side of this partition 38. Thus, fluid under pressure passing through said chambers aspirates fluid from each duct 35-36, the fluid under pressure is mixed with one other fluid at one side and fluid under pressure is mixed with the third fluid at the other side., *Both* ~~both~~ mixtures are completed *by vertical* ~~through~~ baffles 41 at the bottom of holes 37 and are then mixed together in the lower part of the body 3^a, where one or more baffles or perforated plates 9^a are also provided.

In that respect, the device shown *in F*igure 3 would also *be capable* ~~allow~~ *of mixing* ~~to mix~~ more than two fluids, by connection of each circular superposed passage 7 to a fluid container ~~or space~~.

When the device discharges into the open air *F*igures 1 to 5 and 8-9) the invention also provides at the *lower ends of the ports 3, 3a, 20, 50, 60, and 70, a* ~~end of port 3 a~~ narrow portion 42 to prevent splashing and to enhance the effect of the dividing *wall* ~~sift~~ 9.

Referring to *F*igures 6 and 7, 10 is an apparatus or tank of a known kind for softening the water which flows through it. This softening device can of course be of any desired type.

The use of those devices is becoming more and more *general* diffused in domestic life. They are simply connected at the end of a distributing tap 11, of the non-softened water pipe 12.

Previously, however, ~~these plants had a drawback:~~ the connection between softening tank 10 and service tap 11 was provided with a flexible rubber tube 14 and between said tube and tap 11 it is necessary to insert a three-way cock or tap, through which water coming from 11 was either sent through the softening device to come out at 15 or diverted through the three-way cock to be used without any softening.

Those three way cocks are of relatively costly manufacture and are not always tight. ~~Moreover they cause movements of the rubber connection.~~

According to the invention, the three-way cock is done away with and replaced by a simple tap 16 directly fixed on the softening device 10.

The device shown *F*igure 7 is connected to tap 11. Said device corresponds *generally* to the device shown *F*igure 1, with the difference that the air *is admitted from an annular* ~~slits or holes are formed in a circular~~ chamber *B5* ~~ending up in~~ a nozzle 18 *formed thereon.*

In *F*igure 7, the partition 5 is *eliminated as in Figs. 2-4 inclusive* ~~done away with according to a modified form.~~

The converging *end 17 of the upper* ~~or contracting~~ 7 ~~pipe~~ 17*a*, opens out into a *reduced end 19 of a* diverging or expanding pipe 19*a* which is connected to the flexible pipe 14 *and* ~~itself connected~~ to tap 16.

Between the two pipes 17*a*-19*a* there remains *an annular space* ~~a free ring~~ 13 in communication with the *chamber 18a* and nozzle 18 to permit entrance of the air sucked in by the liquid column.

When the two taps 11 and 16 are open, the water flows through tank 10 where it arrives loaded with air. When tap 16 is shut, the water comes out at 18 in the non-softened state.

In the device shown *F*igure 6, a very flexible rubber tube *34* can be provided at the nozzle 18, said tube being fixed to said nozzle, when for special reasons, it not desirable that the fluid flowing through 10 should mix with air. *On account of* ~~Thanks to~~ the *suction* ~~vacuum~~ at 18, resulting from the passage of fluid towards 14, said flexible tube closes itself automatically (see *F*ig. 7).

Having now fully described my said invention, what I claim and desire to secure by letters patent, is:

1. A device for intimately mixing at least two fluids, one of which is under pressure, comprising in combination a hollow cylindrical body connected to a delivery-pipe of fluid *a* under pressure, a passage-way in the wall of said body *for the admission* ~~connected to a space containing~~ a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the hollow body, the cross-section *area* ~~area~~ of the body at the point where said passage is made, and the cross-section *area* ~~area~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

2. A device for intimately mixing at least two fluids, one of which is under pressure, comprising in combination a hollow cylindrical body connectable to a delivery-pipe of fluid under pressure, means for dividing the stream of fluid under pressure; a passage-way down stream said means, in the wall of said body, connected to a space containing a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the hollow a body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

3. A device for intimately mixing at least two fluids, one of which is under pressure, comprising in combination a hollow cylindrical ~~body~~ connectable to a delivery-pipe of fluid under pressure, means for dividing the stream of fluid under pressure, a passage-way down stream said means, in the wall of said body, connected to a space containing a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the *a* hollow body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the fre streaming section for the fluid under pressure immediately up stream said passage, (the means for obliging the fluids to mix together comprising at least two perforated plates up stream the escape opening of the hollow body, these plates being spaced from each other.)

4. A device for intimately mixing at least two fluids, one of which is under pressure, comprising in combination a hollow cylindrical body connectable to a devilery-pipe of fluid under pressure, means for dividing the stream of fluid under pressure, a passage-way down stream said means, in the wall of said body, connected to a space containing a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the hollow body, the cross-section *area* ~~aera~~ of the body at the point

where ~~said~~ passage is made, and the cross-section
9 *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage, the means for obliging the fluids to mix together comprising at least two perforated plates up stream the escape opening of the hollow body, these plates being spaced from each other, and a resserrement in the interior of the hollow body down stream these perforated plates.

~~5. A device for intimately mixing fluids one of which~~ is under pressure, comprising, in combination, a hollow cylindrical body connectable to a delivery-pipe of fluid under pressure, *a* crown of holes in the wall of said body *for the admission of* ~~connected to a space containing~~ a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix *a*together before leaving the hollow body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

6. A device for intimately mixing fluids one of which is under pressure, comprising, in combination, a hollow cylndrical body connectable to a delivery-pipe of fluid under pressure, *a* staggered passage-ways, in the wall of said body *for the admission of* ~~connected to a space containing~~ a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the hollow body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under ~~pressure immediately up stream said passage.~~

7. A device for intimately mixing fluids one of which is under pressure, comprising, in combination, a hollow cylndrical body connectable to a delivery-pipe of fluid under pressure, (*opposed* ~~staggered~~ passages) in the
10 wall of said hollow body, each of which being *open for the admission of* ~~connected to a closed space containing~~ a fluid to be mixed to the fluid under pressure, and means down stream these passages, by which the fluids are forced to mix together, before they escape from

the hollow body, the section *area* ~~aera~~ of the hollow body at the point of each of these passages, and the section *area* ~~aera~~ of the body immediately down stream each passage, being larger than the free streaming section for the fluid under pressure immediately up stream each of these passages.

8. A device for intimately mixing fluids one of which is under pressure, comprising, in combination, a hollow cylindrical body connectable to a delivery-pipe for the fluid under pressure, *alined* ~~a crown of~~ holes in the wall of said body, *said holes* ~~certain~~ of these holes ~~being~~ *being adapted to admit at least one open for the admission of* ~~connected to a closed space containing~~ a fluid to be mixed to the fluid under pressure, ~~other holes being~~ *also open for the admission of air and* ~~connected to another closed space also containing a fluid to be mixed with the fluid under pressure~~, means up stream ~~this~~ *said* ~~crown of~~ holes whereby the stream of fluid under pressure is divided into separate streams, a diametrical partition in the hollow body, dividing the space surrounded by *said* ~~the crown of~~ holes into to separate chambers into which flow the separate streams of fluid under pressure, means down stream this partition comprising longitudinal diverging holes for the fluid under pressure and the other fluids, means down stream this means for mixing all the fluids together before they escape from the hollow body, the sectional *area* ~~aera~~ of the hollow body, at the point where the crown of holes is provided, and the sectional *area* ~~aera~~ of the hollow body immediately down stream these holes being larger than the free streaming passage for the fluid under pressure immediately up stream *said first* ~~this crown of~~ holes.

9. A device for intimately mixing fluids one of which is under pressure, comprising, in combination, a hollow cylindrical body connectable to a delivery-pipe for the fluid under pressure, a crown of holes in the wall of said body, certain of these holes being ~~connected to a closed space containing~~ *open for the admission of* a fluid to be mixed to the fluid under pressure, ~~other holes being~~ *also open for the admission of a second* ~~connected to another closed space also containing a fluid to be mixed with the fluid under pressure,~~ means for controlling the free section of these holes, means up stream *said* ~~this crown of~~ holes whereby the stream of fluid under pressure is divided into separate streams, a diametrical partition

in the hollow body, dividing the space surrounded by *said* ~~the crown of~~ holes into separate chambers into which flow the separate streams of fluid under pressure, means down stream this partition comprising longitudinal diverging holes for the fluid under pressure and the other fluids means down stream this means for mixing all the fluids together before they escape from the hollow body, the sectional *area* ~~aera~~ of the hollow body, at the point where the crown of holes is provided, and the sectional *area* ~~aera~~ of the hollow body immediately down stream these holes being larger than the free streaming passage for the fluid under pressure immediately up stream *said first* ~~this crown of~~ holes.

10. A device for intimately mixing at least two fluids, one of which is under pressure, comprising in combination a hollow cylindrical body connectable to a delivery-pipe of fluid under pressure, a passage-way in the wall of said hollow body, *for admitting a fluid to said body said passageway* ~~an elastic duct connected to this passage-way, this duct being~~ connected to a closed space containing a fluid to be mixed to the fluid under pressure, means, down stream this passage-way, for obliging both fluids to mix together before leaving the hollow body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

11. A device for intimately mixing fluids one of which is under pressure, comprising in combination a cyln-
12 drical hollow body connected to a delivery-pipe for the fluid under pressure, a passage-way in the wall of the hollow body, connected to a rigid duct opening in free air, means down stream this passage-way, for obliging both fluids to mix together before leaving the hollow body, the cross-section *area* ~~aera~~ of the body at the point where said passage is made, and the cross-section *area* ~~aera~~ of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage, a pipe connecting the free end of the hollow body to a tank, and a tap at the entrance of this tank.

Elie Aghnides

13

OATH

American Consulate }
Brussels, Belgium } ss::

Elie Aghnides, the above-named petitioner, being sworn (or affirmed), deposes and says that he is a citizen of the Greek Republic and resident of Brussels, Belgium. that he verily believes himself to be the original, first and sole inventor of the improvements in Fluid mixing devices in which one of the fluids is under pressure. described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented to himself or to others with his knowledge or consent in this or any foreign country for more than two years prior to this application, or on an application for a patent filed in any country foreign to the United States by himself or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by himself or his representatives or assigns in any country foreign to the United States, except as follows: Belgium, December 8th 1934.

(Inventors Full Name:)—Elie Aghnides

Sworn to and subscribed before me this 23rd day of November, 1935.

/s/ Janson Gilbert
(Signature of U. S. Consul.)
Vice Consul of the United States
(Official Character)

American Foreign Office
$2.00 Fee Stamp

14

52923 #2

Fig. 1

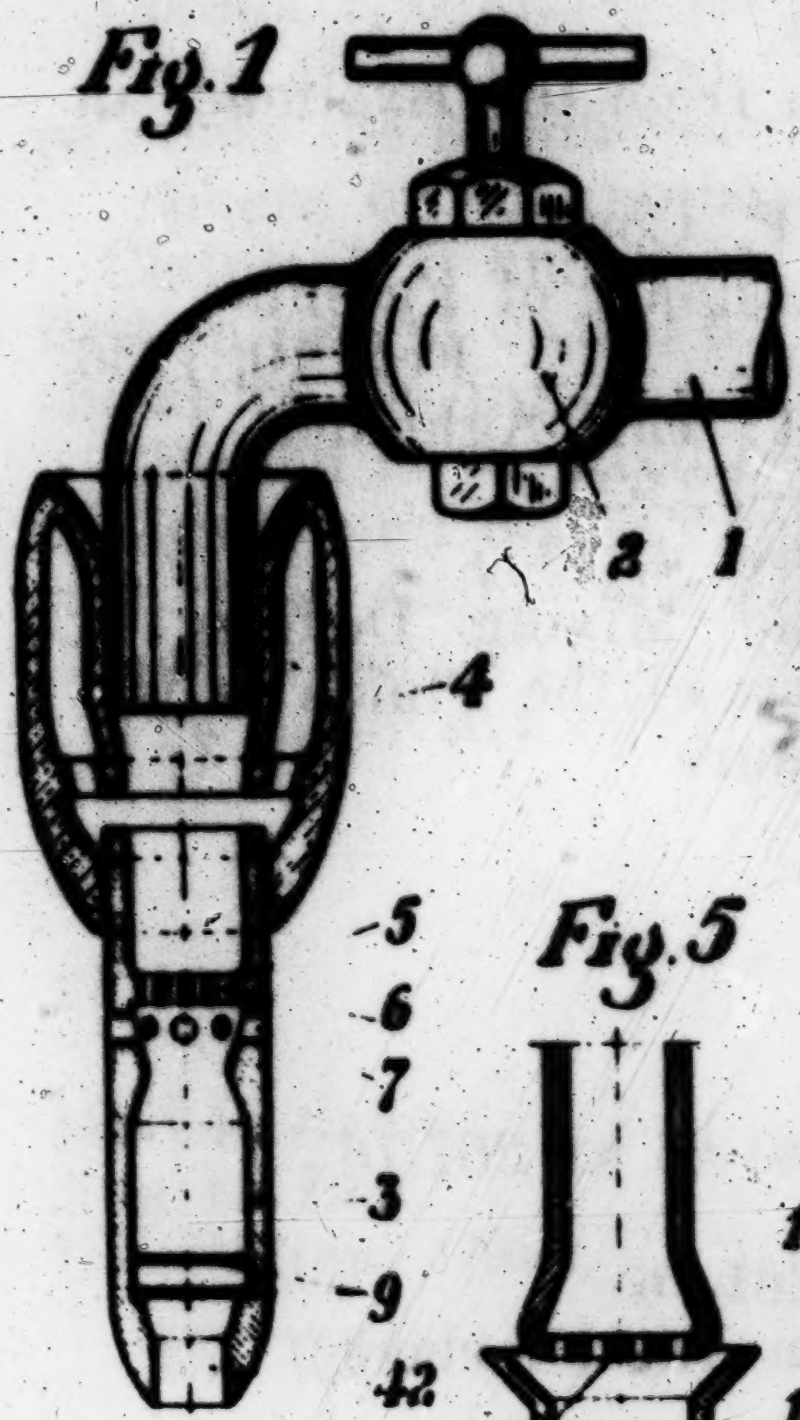


Fig. 2

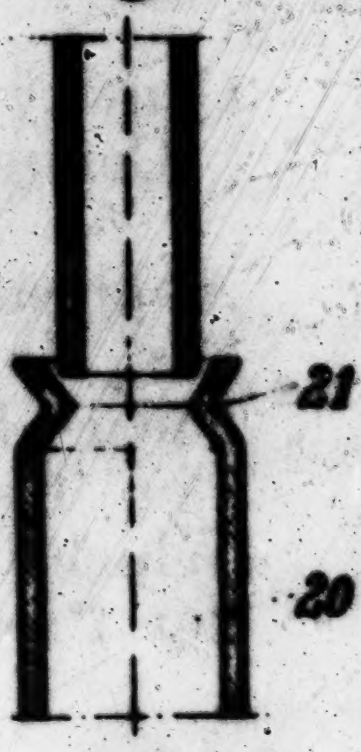


Fig. 3

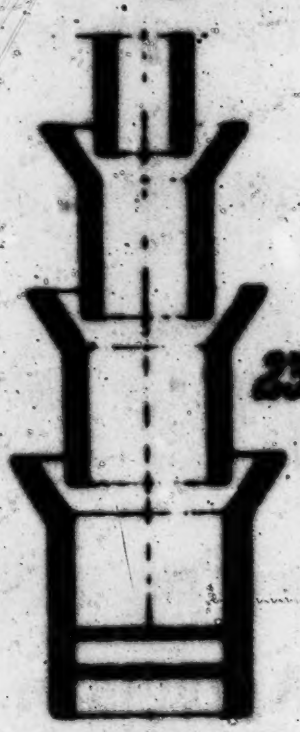


Fig. 4

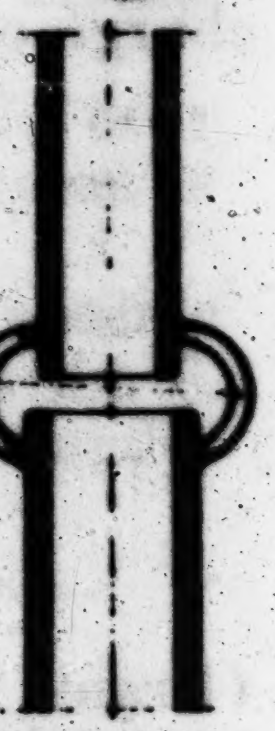


Fig. 5

Fig. 7

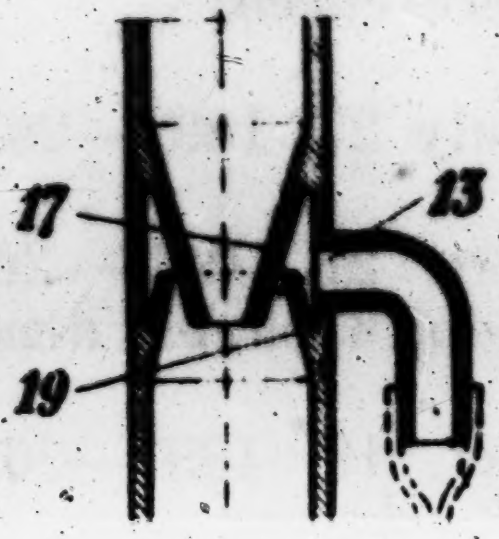
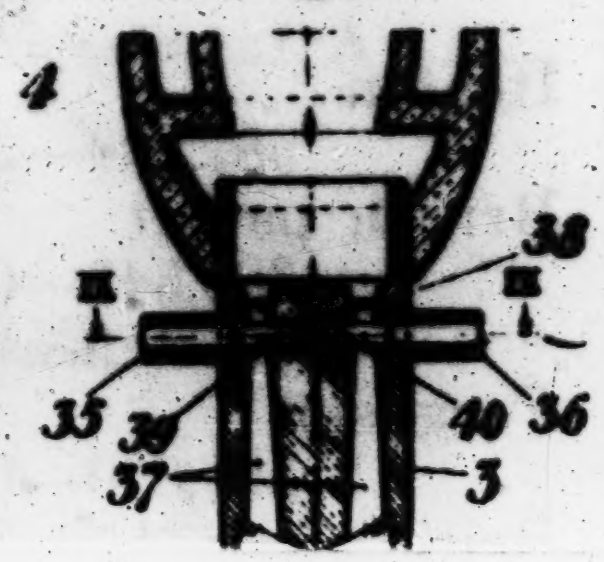


Fig. 8



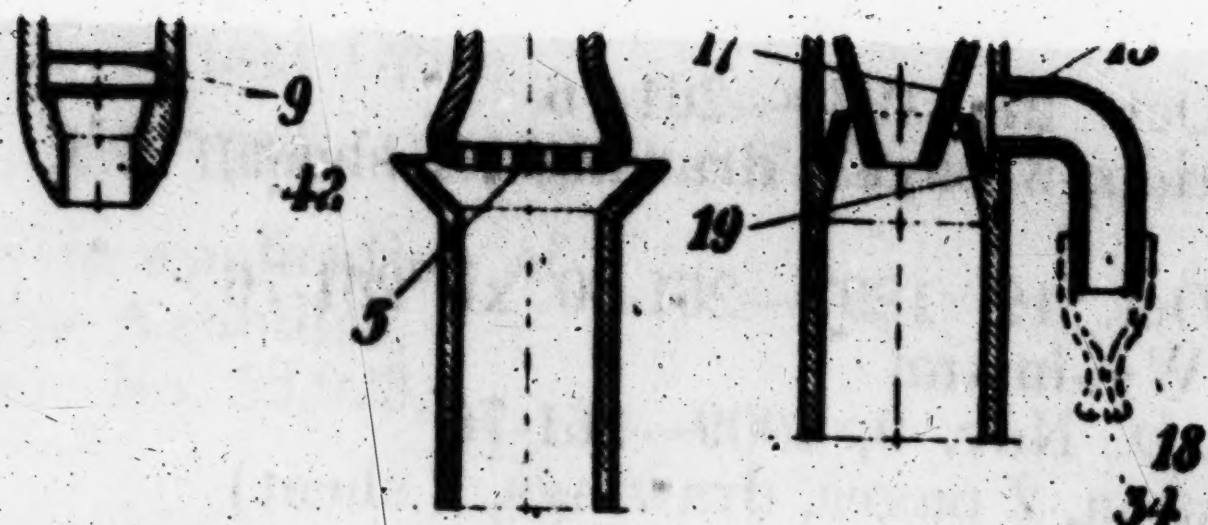
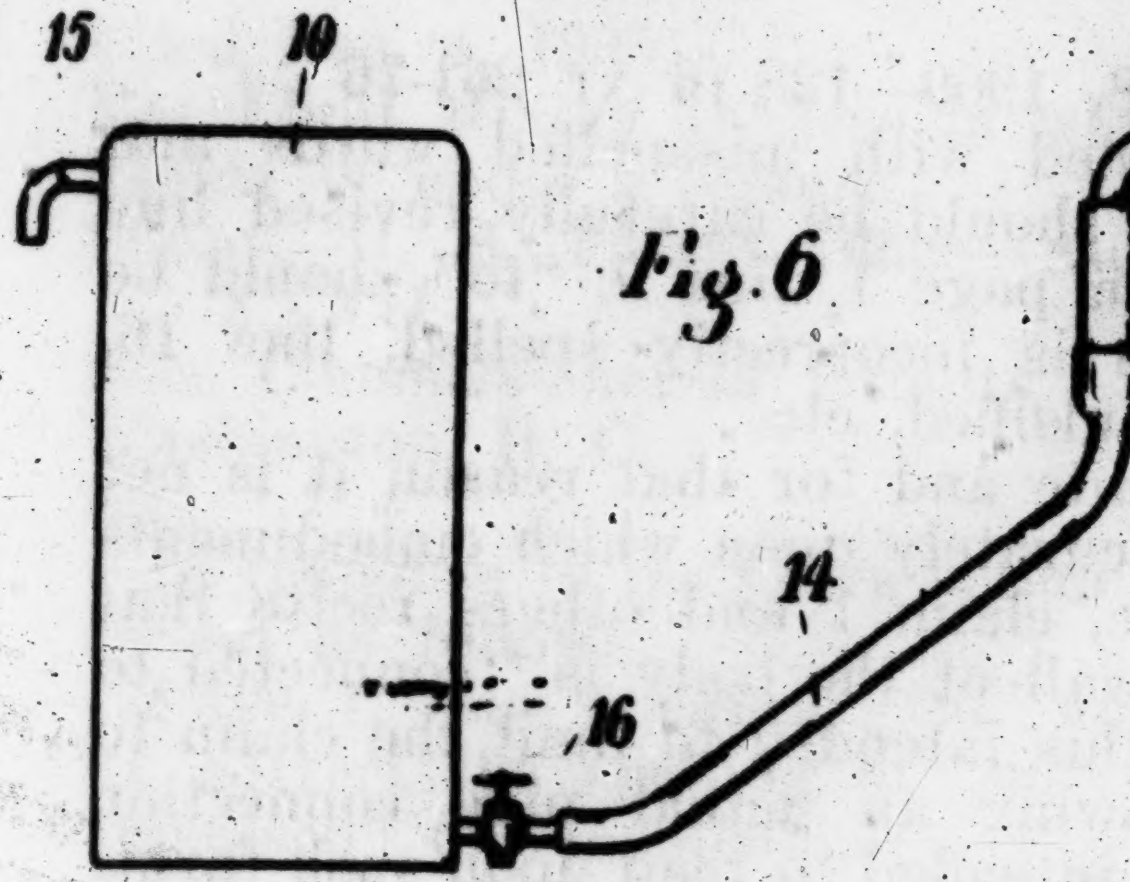


Fig. 6



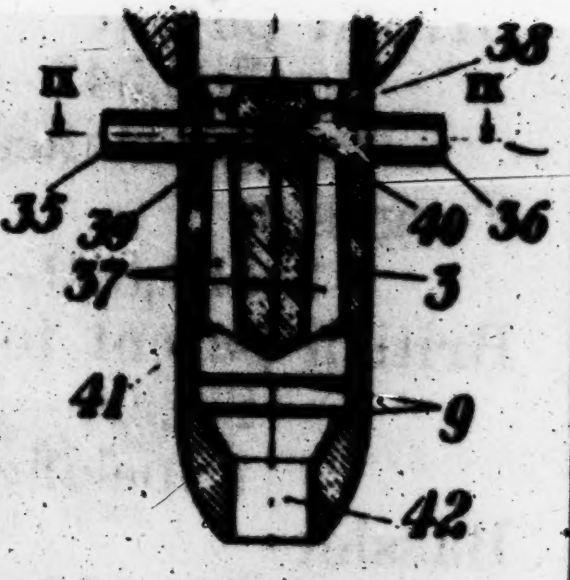


Fig. 9

Inventor
Elie Aghnides
Attorney.

14

5223

K

509

15 Letterhead—

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Please find below a communication from the Exaimner in charge of this application.

Conway P. Coe
Commissioner of Patents
Feb. 10, 1936

Applicant: Elie Aghnides
Ser. No.—52,923
Filed—Dec. 4, 1935
For Fluid Mixing Devices in Which One of the Fluids Is Under Pressure

(Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.)

References:

Heaton
587,203—July 27, 1897—261-66 xr 261-76

British patent
382,542—Oct. 27, 1932—261-76
(specification, 3 pages, drawings, 1 sheet)

Ferguson
591,830—Oct. 19, 1897—261-60 xr 261-76

British patent to Weidmann
25,900—A.D. Nov. 9, 1909—261-76
(Specification, 2 pages, drawings, 1 sheet)

Bassler
944,252—Dec. 28, 1909—128-16 xr 261-76

The description is filled with misspelled words and grammatical errors and should be carefully revised line by line. For example on page 1, line 9, "to" should be with, line 13, agreeable is incorrectly spelled, line 16, "emulsed" should be emulsified, etc.

The claims are indefinite and for that reason it is not possible to determine accurately upon which embodiments they read. For example, claim 1 and others recite that the passageway in the wall of the body is "connected to a space • • • etc." Is this intended to limit the claim to those embodiments showing an actual pipe connection such as 18 to 35 or is it intended to read upon such forms as figs. 1 to 5?

Claims 2 to 4 and 7 to 11 are clearly readable only upon figs. 7 and 8.

Claim 6 is clearly readable only upon fig. 6.

Claims 1, 5 and 6 may be regarded as generic, assuming that the term "connected to a space, etc." has
16 only the significance that the holes are open to atmosphere or to another fluid.

Claims 1, 5 and 6 are rejected as not patentable over British patent 25,900 of 1909, in which a mixing screen is shown in the injector H.

Election is required between claims indicated as specific to figs. 7 and 8 and claims indicated as specific to fig. 6, and these claims are *not* acted upon at this time under Commissioner's Order 3254.

The other art cited is for applicant's information.

CWM—

J. A. Bartholomew
Examiner.

17

Paper No.: 4
Amendment A

Mail Division
Aug 10 1936
U.S. Patent Office

IN THE UNITED STATES PATENT OFFICE

In re application of
Elie Aghnides,
Ser. No. 52,923,

Room 4086
Div. 32.

Filed Dec. 4, 1935,
For Fluid Mixing Devices in which one of the Fluids is under Pressure.

Stamp—U. S. Patent Office—Aug. 13, 1936—Division XXXII

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In response to the Office action of Feb. 10, 1936, kindly amend as follows:

Page 1, line 9, cancel "to" and insert —with—; line 13, correct the spelling of "agreeable"; line 16, change "emulsed" to —emulsified—.

Claims 1, 5 and 6, lines 4 and 5; and claims 2, 3 and 4, line 6; cancel ", connected to a space containing" and insert —for the admission of—.

Claims 7, 8 and 9, line 5; claim 10, line 6, cancel "connected to a closed space containing" and insert —open for the admission of—.

Claim 8, line 7 and claim 9, lines 6 and 7, cancel "being connected to another closed space *also* containing a" and insert —also open for the admission of a second—

Claims 1 and 6, lines 8 and 9; claims 2, 3, 4 and 10, lines 9 and 10; claim 5, lines 7 and 9; claim 7, lines 8 and 10; claim 8, lines 17 and 18; claim 9, lines 18 and 19; and claim 11, lines 7 and 8, change "aera" to —area—

Cancel claims 1, 5, 6 and 11 without prejudice.

18 REMARKS

The Examiner's division of the claims is not understood. Claim 11, not claim 6, would seem to be the sole claim reading on Fig. 6. Note the recital of the tap 16 in the last line of claim 11. As claim 6 is later noted as being generic, evidently claim 11 was meant.

The objectionable language "connected to a space—etc." has been corrected and the meaning of the claims should now be clear. Other formal corrections to the specification and claims will be made upon the indication of allowable subject matter.

Claims 1, 5, 6 and 11 have been canceled and an action on the merits of claims 2-4 and 7-10 is respectfully requested.

Respectfully submitted,
Elie Aghnides,
By Frank S. Appleman,
Frank S. Appleman, Attorney.

Washington, D. C.,
August 10, 1936.

19 Letterhead—

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Oct. 23, 1936

Please find below a communication from the EXAMINER in charge of this application.

Conway P. Coe
Commissioner of Patents

Applicant: Elie Aghnides
Ser. No.—52,923
Filed—Dec. 4, 1935
For Fluid Mixing Devices in which One of the Liquids is under Pressure

(Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.)

As amended Aug. 10, 1936.

Requirement for revision of the specification line by line to correct unidiomatic and ungrammatical expressions is repeated. The specific examples to which attention was called have been corrected. Others have been left unchanged as for instance "non-limitating" in line 8, "this water is more digestive" in line 14; "realizes • • • a foamy emulsion" in line 16; "serious economy of soap and time" in line 17; "confers to" in line 19; all the above being on page 1.

The element 34 must either be shown in solid lines or erased. The use of dotted lines to show alternative construction is objectionable.

The claims have been carefully reconsidered as to which embodiments each is readable upon.

Claims 2 to 4 appear to read upon Figs. 1 and 8. In claim 7, to what does the staggered passages refer? As now viewed this expression appears to limit the claim to Fig. 3 although the description does not call these passages "staggered."

Incidently Fig. 3 bears no reference numerals, which is also objectionable.

Claims 8 and 9 call for "a crown of holes." To what does this refer? Holes 7 of Fig. 1 are called a "ring of holes." Perhaps this is what is meant. But Fig. 8 shows only two holes. These two do not constitute a "crown." However, Fig. 1 does not show separate holes connected to separate fluid sources. It therefore is not apparent how claims 8 and 9 can be read upon any embodiment.

Claim 10 recites an "elastic duct", "connected to a closed space". Upon which figure is this intended to read? Apparently the only figure showing an elastic duct is Fig. 7 and this duct 34 is not shown as leading to a closed space.

Apparently claims 2 to 4 are for allowable subject-matter, and readable upon Figs. 1 and 8 only.

For the reasons indicated claims 7 to 10 are held to be not readable upon any figures and are rejected upon that ground.

Apparently considerable revision of the drawing and claims is going to be necessary. Rule 50 requires that the drawing show every feature claimed. This requirement is not satisfied by building up the claimed structure from selected features picked at random from some half-dozen illustrated embodiments.

H. A. Armstrong
Acting Examiner

CWM
21

Letter to Draftsman

U. S. Patent Office
(Stamp—Apr 27 1937 Division XXXII)

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Ser. No. 52,923 Div. 32
Filed Dec. 4, 1935 Room 4086
For Fluid Mixing Devices in which
One of the Liquids is under Pressure

LETTER TO DRAFTSMAN

Hon. Commissioner of Patents,

Sir:

Please correct the drawings of the above case as indicated in red ink on the attached prints and charge the cost to the account of the attorney, Frank S. Appleman.

Respectfully submitted,
Frank S. Appleman
Frank S. Appleman, Attorney.

Apr. 23, 1937
Not approved

Fig. 1

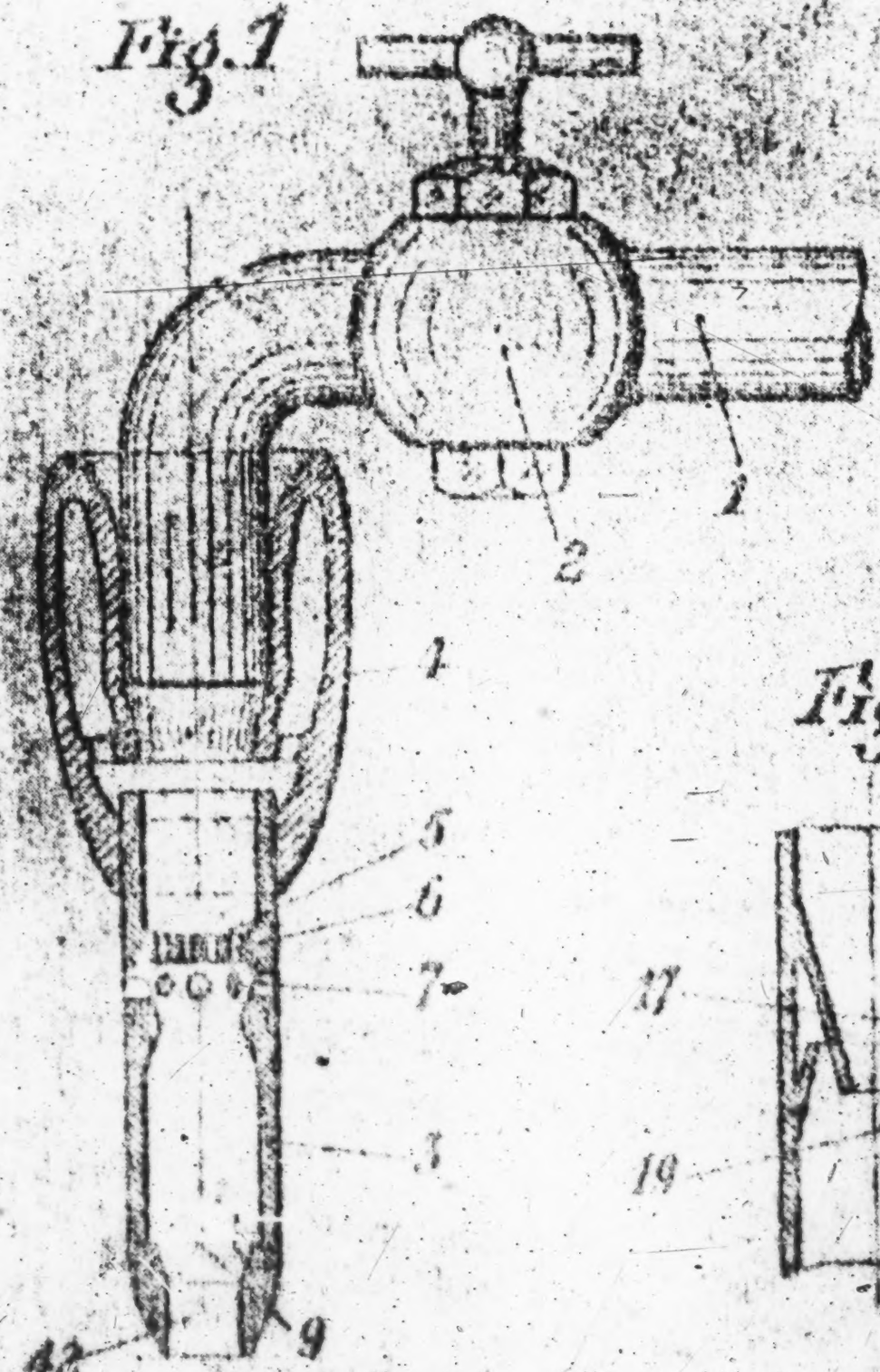
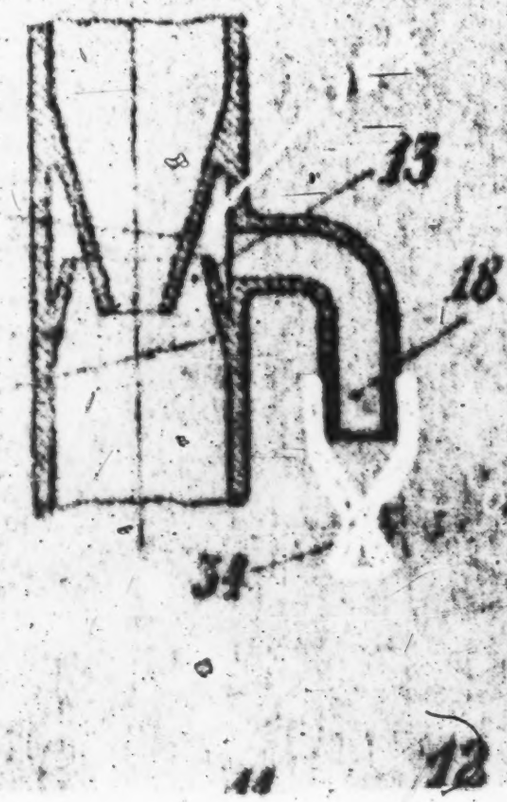


Fig. 7



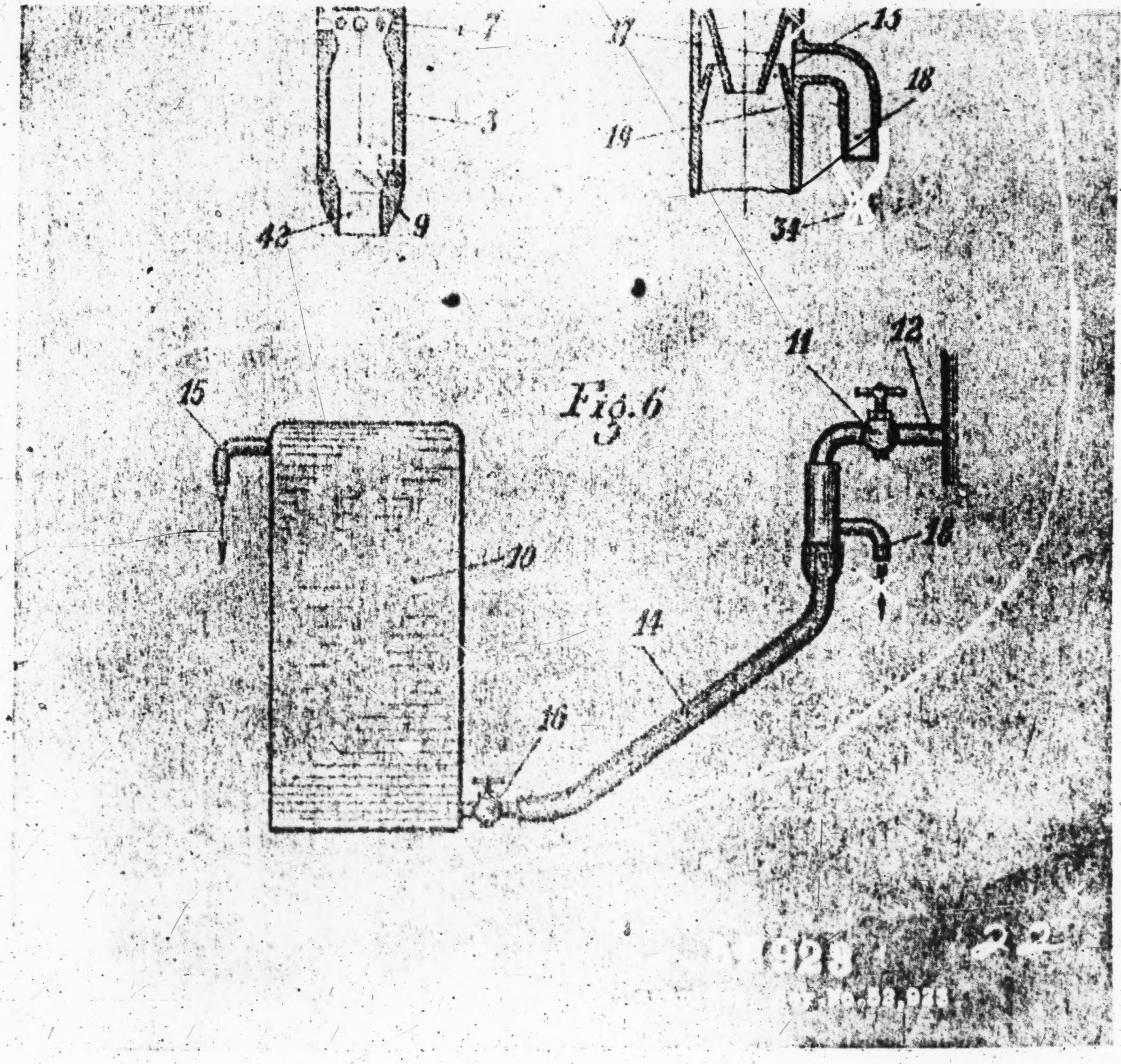


Fig. 6

24 Paper No. 7
Amendment B

Patent Office Stamp—Apr 23 1937

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Ser. No. 52,923 Div. 32
Filed Dec. 4, 1935 Room 4086
For Fluid Mixing Devices in which
One of the Liquids is under Pressure
Hon. Commissioner of Patents,
Sir:

Responding to the official letter of Oct. 23, 1936, the above entitled application is hereby amended as follows:

Page 1, line 8, cancel "but non-limitating case" and insert —embodiment of the invention,—.

Line 10, cancel "obtain" and insert —form at true water and air emulsion—.

Line 10, change the comma (,) to a period (.) and cancel "a".

Line 11, cancel "true water and air emulsion."

Lines 14 and 15, cancel "digestive" and insert—digestible—.

Line 16, cancel "realizes with soap" and insert —and forms—.

Line 17, after "emulsion" insert —with soap—. Also cancel "serious" and insert —real—.

Line 19, cancel "confers to" and insert —gives—

Line 20, cancel "realizes" and insert —causes—.

Line 22, change "pratical" to —practical—. Also cancel "consists" and insert —of the invention occurs,—.

Line 22, insert a comma (,) after "instance".

Line 24, cancel "compelled to"

Line 25, cancel "according to" and insert —of—. After "be" insert —thereby—.

25 Page 1, line 27, cancel "resistant" and insert —lasting—.

Line 28, cancel "comprises" and insert —includes—; also cancel "cases" and insert —instances—

Page 2, line 5, after "pressure" insert —through the device—

Line 6, after "and" insert —of—. Cancel the comma (,).

Line 7, change the comma (,) after "pressure" to a period. Also change "the" (second occurrence) to —The—.

Line 8, after "the" insert —cross—.

Line 15, before "either" insert —formed—.

Line 15, cancel "which contracts itself" and insert —being contracted at its lower end—.

Line 16, cancel "eventually enters in" and insert —extending into—. Also, after "or" insert —formed—.

Cancel line 17 and insert —being widened at the top to receive the lower end of the part above, or with the part—.

Line 18, after "above" insert —being—.

Line 18, after "passage" insert —and extending therein—.

Line 21, cancel "or call of" and insert —and draws—. Also cancel "and this air" and insert —which—.

Line 23, cancel ", provided to that end, with" and insert —by means of—.

Line 24, after "baffles" insert —provided for this purpose—.

Line 26, cancel "in certain cases or applications" and insert —by various means—.

Line 27, cancel "it contributes to considerably" and insert —wherein it acts to—. Also after "plant" insert —considerably—.

Line 29, change "fig." to —Fig.—. Also, after "an" insert —vertical and—. Change "an" to —a—

Line 31, change "fig." to —Figs.— Also cancel the matter after "5" and insert —inclusive are vertical axial sections of modifications of the aerating device of Fig. 1,—

26 Page 2, line 32, change "fig." to—Fig.—.

Page 3, line 1, change "fig." to—Fig.—.

Line 1, cancel "cross-section at" and insert—vertical axial section on—.

Line 2, change "figure" to—Figure—.

Line 3, change "fig." to—Fig.—.

Line 3, cancel "a cross section through a modified form" and insert—an axial vertical section of a further modification—.

Line 5, change "fig." to—Fig.—.

Line 6, change "figure" to—Figure—.

Line 7, change "figure" to—Figure—.

Line 7, cancel "for instance".

Line 11, cancel "this is realized by means of" and insert—shown comprises—.

Line 13, after "part" insert—3—.

Line 13, after "provided" insert—with—and cancel the rest of the line.

Line 14, cancel "a transversal" and insert—an internal transverse—.

Line 15, after "the" (second occurrence) insert—air—.

Line 16, after "surface" insert—thereof. The—. Line 16, cancel "between the water and the air; the".

Line 18, cancel "Above" and insert—Below—.

Line 19, cancel "in respect to the current of water".

Line 20, after "of" (second occurrence) insert—the total section of said holes 7 of—.

Line 21 at the end of the line insert—said—.

27 Page 3, cancel lines 23 and 24.

Line 26, change "of" at the beginning of the line to—or—Also cancel "realize" and insert—form—.

Line 27, cancel "ensuring" and insert—to insure—.

Line 28, cancel "total section of passage" and insert—diameter— .

Line 29, change "fig." to—Fig.—. After "5)" place a period (.) and cancel the rest of the line.—

Line 30, cancel "water. In the same way, the" and insert—The—.

Line 31, change "figures" to—Figures—.

Line 32, after "5" insert—inclusive—.

Line 33, change "figure" to—Figure—. Also cancel "upper" and insert—lower—.

Page 4, line 1, cancel "below" and insert—20ª above—.

Line 2, after "expanding" insert—or venturi—.

Line 2, change "figure" to—Figure—. also cancel "is".

Line 3, cancel "manifold and". After "stepped" insert —and funnel mouthed—.

Line 3, after "rings" insert—50, 51, 52, each respectively being of a smaller diameter than the one immediately below it. Said rings are axially alined with each other and with a still smaller fluid admission pipe 53 above the upper ring 52. Annular spaces 50ª, 51ª and 52ª admit the air.—.

Cancel "and" at the end of line 3.

Line 4, cancel "in figure" and insert—Figure—; cancel the matter after the numeral "4" and insert—shows a

lower pipe 60 connected to a smaller upper pipe 61 by means of clips 23.—.

28 Page 4, cancel line 5 and insert—The adjacent pipe edges 60ª and 61ª are spaced slightly to provide an annular air admission space.—

Cancel line 6.

Between lines 6 and 7 insert—

—Fig. 5 discloses a lower pipe 70 having a flared mouth 71. Above the pipe 70 and spaced slightly therefrom to provide an annular air admission space is a smaller pipe 75. The lower end of the pipe 75 is flared as at 72 and closed by a partition 73 through which a plurality of holes 74 are formed.—

Line 7, change "figure" to—Figure—

Line 9, change "device" to—devices—. Also, after "in" insert—any of—

Line 10, cancel "one part of holes 7 is in relation" and insert—at least one hole corresponding to one of the holes 7 of Fig. 1 is connected—.

Line 11, cancel "comprising" and insert—containing—.

Line 11, after "other" insert—corresponding holes are connected—.

Lines 11 and 12, cancel "part in relation".

Line 12, cancel, "comprising" and insert containing—.

Line 12, cancel "; those" and insert—. Those—.

Line 14, cancel "mix" and insert—be mixed—.

Line 14, cancel "thanks to" and insert—by—. Also cancel "sift" and insert—wall—.

Line 16, change "3" to—3ª—.

Line 18, cancel "or space".

Line 19, cancel "; each" and insert—. Each—.

Line 20, change "3" to—3ª—. Also cancel the matter after "through".

29 Serial No. 52,923—6

Page 4, cancel line 22 and insert—The upper part of the body 3ª is solid—.

Line 23, cancel "nature,"; also cancel "through". After "part" cancel the comma (,) and insert —is provided with—.

Line 24, after "section" insert —in a downward direction—.

Line 24, cancel "are pierced",.

Line 26, change "succion" to —suction—.

Line 26, cancel "ports 7′ : a" and insert —the ducts 35 and 36. A—.

Line 27, change "in" to —into—; after "body" change "3" to —3ª—.

Line 28, change "3" to —3ª—.

Line 30, change "This" to —Thus—.

Line 33, cancel ": both" and insert —. Both—.

Line 34, cancel "through" and insert —by vertical—.

Line 35, change "3" to —3ª—.

Page 5, line 1, change "9" to —9ª—.

Line 2, after "shown" insert —in—. Change "figure" to —Figure—. Cancel "allow" and insert —be capable

Line 3, cancel "to mix" and insert —of mixing—.

Line 4, after "passage" insert —7—

Line 4, cancel "or space".

Line 5, change "figures" to —Figures—

Line 6, cancel "end of part 3 a" and insert —lower ends of the parts 3, 3ª, 20, 50, and 70, a—.

Line 8, cancel "sift" and insert —wall—.

Line 9, change "figures" to —Figures—

Line 12, cancel "diffused" and insert —general—.

30 Serial No. 52,923—7

Page 5, line 15, cancel "those plants had a drawback:"

Line 19, change "softering" to —softening—.

Line 23, cancel the matter after the period (.)

Cancel line 24.

Line 28, change "figure" to —Figure—.

Line 29, after "correspondence" insert —generally—.

Line 29, change "figure" to —Figure—.

Line 30, cancel "slits or holes are formed in a circular". and insert —is admitted from an annular—

Line 31, cancel "ending up in" and insert —18ª surrounding and connecting the adjacent ends of an upper and a lower pipe 17ª and 19ª respectively. The chamber 18ª has —.

Line 31, after "18" insert —formed thereon—.

Line 32, change "figure" to —Figure—.

Line 32, cancel done away with according to" and insert —eliminated as in Figs. 2-4 inclusive—

Line 33, cancel "a modified form."

Line 33, after "converging" insert —end 17 of the upper—.

Line 33, cancel "or contracting"; change "17" to —17ª—.

Page 6, line 1, after "a" insert —reduced end 19 of a—. After "pipe" change "19" to —19ª—.

Line 2, cancel ", itself connected" and insert —and—.
Line 3, change "17-19" to —17ª-19ª—.
Line 3, cancel "a free ring" and insert —an annular space—.
Line 4, before "nozzle" insert —chamber 18ª and—.
Line 9, change "figure" to —Figure—.
Line 12, change "Thanks to" to —On account of—.
Line 13, cancel "vacuum" and insert —suction—. Line 14, change "fig." to —Fig.—
31 Claim 7, line 4, cancel "staggered" and insert —opposed—.
Claims 8 and 9, line 4, cancel "a crown of" and insert —alined—.
Lines 4 and 5, cancel "certain of ——container for a" and insert —said holes being adapted to admit at least one—.
Lines 6, 7 and 8, cancel "other holes—under pressure".
Claim 8, line 8, cancel "this".
Line 9 cancel "crown of" and insert —said—.
Line 11, cancel "the crown of" and insert —sand—.
Claim 9, line 9, cancel "this crown of" and insert —said—.
Line 12, cancel "the crown of" and insert —said—; also cancel "to".
Claims 8 and 9, last line, cancel "this crown of" and insert —said first—.
Claim 10, cancel line 5 and insert —for admitting a fluid to said body, said passageway being—.

REMARKS

The specification has been carefully revised to correct the formal errors therein.
Corrected prints and a letter to the Chief Draftsman is attached.
Claims 2, 3, 4 stand allowed.
Claims 7-10 inclusive have been amended to define the invention claimed more clearly and are now believed to be free from the noted objections. As no art has been cited, these claims should now be allowable.
cited, these claims show now be allowable.

E. Aghnides
By Frank S. Appleman
Frank S. Appleman, Attorney.

Apr. 23, 1937 A•S•L

32

Paper No. 8
Amendment C

U. S. Patent Office Stamp—Apr. 30 1937

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 52,923
Filed Dec. 4, 1935

Stamp—U. S. Patent Office—May 3, 1937
Division XXXII.

For Fluid Mixing Devices in which
One of the Liquids is under Pressure
Hon. Commissioner of Patents,
Sir:

Supplemental to amendment filed Apr. 23, 1937, additional amendment is hereby made as follows:

Cancel the matter inserted on page 5, line 6.

Page 5, line 6, after "the" (second occurrence) insert —lower ends of the parts 3, 3ª, 20, 50, 60 and 70, a—

Respectfully submitted,
Elie Aghnides
By Frank S. Appleman
Frank S. Appleman, Attorney.

A-LBL
Apr. 30, 1937

33 Letterhead

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Please find below a communication from the EXAMINER in charge of this application.

Conway P. Coe
Commissioner of Patents
Mailed Jul 14 1937

Applicant: Elie Aghnides
Ser. No.—52,923
Filed—Dec. 4, 1935
For Fluid Mixing Devices
in which one of the fluids
is under pressure

(Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.)

As amended Apr. 23 and 30, 1937.

Permission to amend the drawing with respect to Fig. 1 and Fig. 3 is not granted. There is nothing in the amended specification to indicate what 9 and 9b are supposed to represent as amended. In any event, the amendment does not show "two perforated plates" as described in the original description. This portion of the amendment is held to be new matter.

The case now contains claims 2, 3, 4 and 7 to 10.

Claims 2, 3 and 4 are held to read upon figs. 1 and 8 only.

Claims 8 and 9 could not be amended as directed since the claims do not contain the words "container for a". It is impossible to tell what applicant wants to have cancelled.

As near as the examiner can determine, claim 7 reads only upon figs. 1 and 8 also.

Claim 10 does not read upon any figure. Which embodiment shows cylindrical body connected to "a delivery pipe of fluid under pressure" and also to a closed space containing a fluid to be mixed to the fluid under pressure? The examiner can find no such structure shown.

It appears obvious from the art of record that the broad of idea of aspirating a gas into a liquid stream is old in numerous structures similar to applicant's and that any invention in this case lies in specific details of the aspirator. Applicant has shown some eight forms of aspirators. It is obvious that these cannot all be covered by a generic claim.

34

From the present informal condition of the claims it is not possible to tell what species they are intended to cover but it is clear that none even purport to be generic. For example, none purport to cover figs. 2 to 4.

In accordance with Commissioner's Order 3254, to which applicant's attention was previously called, he is required to elect the preferred species in his response.

He is further required to rewrite the entire specification and claims 8 to 10, as these claims, as well as the specifications, are substantially unreadable because of numerous amendments.

After two office actions and two responses the case does not appear to be sufficiently clear to enable the art to be applied in any intelligent manner. No generic claims appear in the case and no election of species has been made.

A new direction should be sent for amendment of the drawing, omitting the parts which are for new matter.

In view of the informal condition of the case an early response is urged.

Fish
Examiner.

CWM

35 Mail Division
Jan. 4, 1938
U. S. Patent Office

Stamp—U. S. Patent Office—Jan 6 1938—Division XXXII.

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 52923
Filed Dec. 4, 1935
For Fluid Mixing Devices

Div. 32
Room 4086

Hon. Commissioner of Patents,

Sir:

Owing to the fact that a continuing application has been filed under date of December 31, 1937, Serial No. 182884, which also includes the subject matter of this application, this application is not further prosecuted.

Respectfully submitted,
Elie Aghnides,
By Frank S. Appleman
Frank S. Appleman, Attorney.

Jan. 4, 1938
FSA*LBL

Not up for action. Is response necessary. Will become abandoned Jan. 14.

See that continuing case referred to contains proper reference to this case.

47

1935

CONTENTS

1. Application ..... papers.
2. Trial—Dec. 9, 1935
3. Rejection—Feb. 10, 1935
4. Amendment—A—Aug. 10, 1936
5. Rejection—Oct. 23, 1936
6. Letters to Draftsman—2 Prt—Apr. 23, 1937
7. Amendment—B—Apr. 23, 1937
8. Amendment & Suppl.—Apr. 30, 1937
9. Letter—Jul. 14, 1937
10. Letter—Jan. 4, 1938
11. Petition for Access—Dec. 14, 1942
12. Petition for Access—Feb. 9, 1944
13. Petition for Access—Feb. 12, 1944
14. Petition for Access—Nov. 25, 1947
15. Petition for Access—Apr. 22/48
16. Petition for Access—Mar. 18, 1949
17. Petition for Access—Nov. 10, 1949
18. Petition for Access—Jan. 25, 1950
19. Petition for Access—Jan. 30-50
20. Petition for Access—June 2, 1950

Note

Page 2 App. 49 is
on Card 8.

(Stamp—U.S. Patent Office Dec. 31, 1937)
Dec. 31-37, 123408
K—Check—30.00

1

PETITION

To the Commissioner of Patents:

Your petitioner, ELIE AGHNIDES, a citizen of the Greek Republic, and a resident of Brussels, Belgium, whose post-office adress is *609 West 158th St., New York, N. Y.* ~~11 Boulevard Waterloo, Brussels, Belgium,~~ prays that letters patent may be granted to him for the invention in FLUID MIXING DEVICES, set forth in the annexed specification; and he hereby appoints FRANK S. APPLEMAN, of 1331 G. Street, Northwest, Washington, D. C., his attorney, with full power of substitution and revocation, to sign the drawings, to prosecute his application, to make alterations and amendments therein, to receive the patent, and to prosecute all business in the Patent Office connected therewith.

Elie Aghnides

(U. S. Patent Office Jan 10 1938 Division XXXII)

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN That I, ELIE AGHNIDES, a citizen of the *New York* ~~Greek Republic,~~ residing at *New York,* ~~Brussels, Belgium,~~ have invented certain new and useful improvements in FLUID MIXING DEVICES, of which the following is a specification:

2 This invention relates to a device for intimately mixing a gas with a liquid, and ordinarily is employed for aerating water. This application is a continuation in part of my earlier application Serial No. 52,923, filed December 4, 1935.

Broadly speaking, my invention consists of a device intended to be connected to a source of liquid under pressure, such as an ordinary water tap, and includes a chamber provided with *one or more aperatures* ~~an aperature~~ through which the water is forced into the chamber with substantial velocity and as a result the liquid stream has very substantial kinetic energy. Proper openings are provided leading into the chamber from the outside air

so that the flow of water will draw air into the chamber according to the well-known venturi principle. In accordance with my invention, ~~baffle~~ means are provided in the path of the *III* water jet ~~so that when the water strikes them this baffle, its kinetic energy will be utilized to break up the stream into fine particles or drops which thoroughly mix with air~~. An outlet for the chamber is provided from which the water mixed with air can emerge. It is advisable to have the outlet of smaller cross section than the *cross section of the* chamber so that the water will flow in a coherent stream; but the outlet should be of sufficient size relative to the aperature *or aperatures* through which the water is introduced into the chamber so that the water mixed with air will emerge at a substantially lower velocity than the water entering the chamber. Of course, when I refer to the outlet forming a coherent stream, I do not mean to imply that the outlet cannot be divided into several such streams, if desired.

3 The essential feature of my invention is an arrangement of the baffle means relative to the inlet aperature so that the force of the stream or jet on striking the baffle serves to break up the stream or jet as much as possible. Accordingly, this baffle must be correctly positioned relative to the inlet aperture to give this result, which demands a proper placing both as regards distance and angle so that the water will have a definite *breaking effect on both fluid and air* ~~splashing effect.~~ A baffle arranged close to the inlet aperature and more or less following the line of the path of the water will not give the desired result but will simply cause the path of the water to be deflected without the water stream being broken up. However, such a deflector could be used to turn the path of the water against the walls of the chamber provided that the pressure is great enough so that when the water is spread out over such deflector it still maintains sufficient velocity so that when striking the walls of the chamber *both water and air is broken up* ~~it is splattered into droplets and mixed with the air.~~

In the referred embodiment of my invention, ~~the aperture through which~~ the water is introduced into the mixing chamber *through* ~~is subdivided into~~ a plurality of apertures, ~~as in this case it is easier to break up each stream into small droplets.~~ Also I find that a highly efficient form

of *dividing means* ~~baffle for causing the~~ *breaking* ~~splattering effect~~ is a fine screen located at the outlet, *and I have found.* ~~Such screen serves a double function, for not only does it serve to cause the streams or jets of water and air to be broken up from the apertures to splash back into the chamber to mix with the air, but it also tends to finely subdivide the air and the water passing through it any bubbles in the emerging water. For this latter reason~~

4 ~~I find~~ that even better results can be obtained if two or more *superposed* screens are used in the outlet discharge. In that case the first screen serves as a baffle and also serves to subdivide somewhat the air bubbles, while the second screen, serves principally to cause a further subdivision of the air *and the water* ~~bubbles.~~ The size of the mesh employed is not critical but I have obtained good results where the holes in the screen measured about .6 square millimeter ~~and the water.~~

My invention can readily be understood by reference to the accompanying drawings, in which Fig. 1 is a sectional view of a device embodying my invention which is shown as attached to an ordinary water faucet through the medium of a connecting device such as is described in my Patent No. 2,071,780; Fig. 2 is a sectional view of a device adapted to be screwed onto an ordinary water pipe; Fig. 3 is a section on line 3—3 of Fig. 2; Fig. 4 is a sectional view showing a further modified form; Figs. 5, 6, 7 and 8 are additional sectional views showing further modifications; and Fig. 9 is a section on line 9—9 of Fig. 8.

Referring now to Fig. 1, 10 designates an ordinary faucet or tap. 12 is a tap connector, the operation of which is described in detail in my patent above referred to. 14 is the casing of the mixing device enclosing the primary mixing chamber. The perforated screen 16 admits the water into the casing 14 in the form of a plurality of jets. A plurality of air ports 18 are provided for admission of air into the interior of the casing 14. 20 is a screen at the lower part of the casing, and below the screen 20 the casing narrows to form a passage 22.

5 When the water is turned through this device, if the faucet is only opened slightly so that very little kinetic energy is developed in the water as it emerges from the perforations in screen 16, the water will come out of the discharge 22 in a perfectly normal manner.

However, as the water pressure is increased and the velocity increases, the water emerging from the perforations of screen 16 will draw air into the chamber through the ports 18 and this water striking the screen 20 at comparatively high velocity will ~~splatter back into the chamber and be broken up and~~ *finely divided* ~~thoroughly mixed with the air.~~ This water, again contacting with the screen 20, will pass through the screen with the air and emerge from the outlet 22. As the diameter of outlet 22 is substantially greater than the aggregate diameter of the perforations in screen 16, the water will have relatively low velocity as it comes out from the discharge.

When my device is functioning, the water, due to the thorough admixture of air, has characteristics which are surprisingly different from those of water as ordinarily discharged from a faucet. For example, if one's hand is put in the course of the water, the water will flow evenly and uniformly over the surface and will wet the entire surface without splashing. Also it will be found that if the discharge from such faucet is allowed to flow into a weak soap solution, it will make an extraordinary amount of foam, which will be found very useful for washing; for instance, when washing clothes or dishes. Again it will be found that the introduction of the air into the water will raise its dissolved oxygen content and the aeration tends to remove objectionable odors and gases from the water, rendering it more palatable. These effects are apparently due to the extreme thoroughness with which the aeration takes place in my device and the results are quite different from the results obtained by ordinary injection devices in which the air is not thoroughly broken up so that when the two fluids leave the apparatus, the air quickly separates from the water *jet* ~~and affects very little of the water.~~

In the form of device shown in Fig. 2, a metal casing 24 is screwed directly onto the faucet 11. This casing holds the screen 26 against the mouth of the faucet and the casing is provided with an outlet screen 28. A series of ports 30 are provided in the casing to admit air in a manner similar to that already described in connection with Fig. 1.

In Fig. 4 the casing 32 is provided with a union coupling 34 for connection to an ordinary hose bib. The screen 36 is clamped between the casing 32 and the mouth of

the hose bib. Air is admitted to the interior of the casing by a series of horizontal perforations 38. In this case two screens are provided at the outlet as indicated at 40 and 42, which will cause the air bubbles in the water to be somewhat smaller than where only a single screen is employed.

Fig. 5 illustrates a case where a single aperture is employed for admitting fluid to the chamber. In this figure, the casing 44 is screwed to the faucet 46 and clamps in place a plate 48 having a single aperture in the middle. A plate 50 supported by legs 52 is positioned in the lower part of the chamber and below this is ~~preferably~~ po-
7 sitioned a screen 54. The water from the aperture in plate 48 strikes plate 50 and due to its kinetic energy the stream is broken up and thoroughly mixed with the air. ~~Some valuable results could be obtained even if the screen 54 is omitted, but it is advisable to use it.~~

In Fig. 6 the plate 56 has a plurality of holes near the periphery and the casing 58 is formed with inwardly extending projections as indicated at 60. The principal part of the water coming through the openings in the plate 56 will strike these projections and be broken up as previously described. *In this case, a screen 62 is also used in the device.* ~~Here again it is advisable, but not essential, to use a screen as indicated at 62.~~

An effect similar to that shown in Fig. 6 is illustrated in Fig. 7 except that instead of having a plurality of apertures in the plate, the plate 64 has a single central orifice shaped to throw the water outwardly. The casing 66 again has projections as indicated at 68 similar to the projections 60 described above.

Another form of my device is shown in Figs. 8 and 9. In this arrangement it is possible to mix three fluids, one of which is under pressure. Leading into a mixing chamber 72 are a plurality of passages 74 to permit entrance of a fluid under pressure into the mixing chamber 72 enclosed by casing 70. The inlet port 76 intersects and leads into one group of passages 74 near the upper end of the passages; and another inlet port 77 likewise intersects and leads into another group of passages 74. The inlet ports 76 and 77 do not connect with one another; in consequence the channels 74 are grouped into two sections, each section being connected to an inlet port. In this form of my device each inlet port may admit a dif-

ferent fluid into the mixing chamber. The cross-sec-
8 tional area of passages 74 is greater after intersection by inlet ports 76 and 77 and the cross-sectional area of the passages continues to increase as the passages approach the mixing chamber. As in preceding examples, the fluid under pressure courses through passages 74 and draws fluids from inlet ports 76 and 77 into the enlarged portion of passages 74. Baffles 78 project into the passages at the point where the passages discharge into the mixing chamber. The baffles in part interrupt the course of the fluids in each passage and thereby serve to effect a preliminary mixing of the fluids. Within the mixing chamber two screens 80 in spaced relation are placed across the path of the fluids emerging from the passages 74 to interrupt abruptly the course of all such fluids and thereby cause the fluids to mix and sub-divide into minute particles. The fluids are discharged through the outlet 82.

While I have referred to *perforated upstream* plates ~~forming the inlet apertures~~ and *downstream screens* ~~for the outlet baffles~~, it is possible to use perforated plates or (except in certain forms) screens in either position. In the various forms of device shown, the screens and the plates forming the apertures are made readily removable so that the devices can easily be cleaned.

While I have described my device as principally intended for the aeration of water to improve the characteristics of the water for use, it may also be employed for other related purposes such as for washing air or other gases or for cooling, and in connection with such cooling
9 operations it may be employed for causing condensations to take place, and generally speaking my invention can be used for mixing two or more fluids, at least one of which is under pressure.

10 What I claim is:

1. A device of the type described comprising a chamber, an aperture to admit liquid into such chamber, means for delivering to such aperture liquid under sufficient pressure so that the liquid emerging therefrom moves with substantial kinetic energy, a passage leading into such cahmber for the admission of air, baffle means in the path of liquid emerging from said aperture adapted abruptly to interrupt the path of movement of such liquid whereby the kinetic energy of such liquid causes the stream of liquid to be broken up and mixed with the air in said chamber and a passage from said chamber adapted

to discharge the liquid mixed with air at a velocity substantially less than the velocity of the liquid emerging from the aforesaid aperture.

2. A structure as specified in claim 1, in which the liquid is admitted into said chamber through a plurality of apertures.

3. A structure as specified in claim 1, in which the liquid is admitted into such chamber through a plurality of apertures formed in a removable screen.

4. A structure as specified in claim 1, in which the baffle means comprises a screen positioned across the discharge from said chamber.

5. A structure as specified in claim 1, in which the liquid admitted into the chamber passes through a plurality of openings in a screen and a plurality of screens are positioned across the discharge from the chamber ~~and one of such screens serves as a baffle means to interrupt the path of movement of the liquid.~~

11 6. In combination with a water faucet, a casing adapted to be attached to such faucet, a perforated member held across the mouth of such faucet by such casing, a chamber below such screen, air passages leading into such chamber whereby air may be drawn into such chamber by the action of water emerging from said perforated member, an outlet from said chamber and a screen across said outlet adapted to serve as a baffle whereby the kinetic energy of the water entering said chamber causes the water to admix with air drawn into such chamber and subsequently permits the water mixed with air to pass out through the discharge from said chamber.

7. A device for intimately mixing at least two fluids one of which is under pressure comprising in combination a hollow body having means for connecting said body to a delivery pipe of fluid under pressure, means for dispersing the fluid under pressure, inlets downstream said means and in the wall of said body for the admission of a fluid to be mixed with the fluid under pressure and means downstream the inlets for causing both fluids to mix together before leaving the hollow body, the cross sectional area of the body at the point where said inlets occur and the cross sectional area of the body immediately downstream said inlets being larger than the free streaming section for the fluid under pressure immediately upstream said inlets.

12 8. A device for intimately mixing at least two fluids one of which is under pressure comprising in combination a hollow body having means for connecting said body to a delivery pipe of fluid under pressure, means for dispersing the fluid under pressure, inlets downstream said means and in the wall of said body for the admission of a fluid to be mixed with the fluid under pressure and means downstream the inlets for causing both fluids to mix together before leaving the hollow body, the cross sectional area of the body at the point where said inlets occur and the cross sectional area of the body immediately downstream said inlets being larger than the free streaming section for the fluid under pressure immediately upstream said inlets, the means for causing the fluids to mix together comprising at least two perforated members upstream the escape opening of the hollow body, these members being spaced from each other.

9. A device for intimately mixing at least two fluids one of which is under pressure comprising in combination a hollow body having means for connecting said body to a delivery pipe of fluid under pressure, means for dispersing the fluid under pressure, inlets downstream said means and in the wall of said body for the admission of a fluid to be mixed with the fluid under pressure and means downstream the inlets for causing both fluids to mix together before leaving the hollow body, the cross sectional area of the body at the point where said inlets occur and the cross sectional area of the body immediately downstream said inlets being larger than the free streaming section for the fluid under pressure immediately
13 upstream said inlets, the means for causing the fluids to mix together comprising at least two perforated members upstream said inlets, the means for causing the fluids to mix together comprising at least two perforated members upstream the escape opening of the hollow body, these members being spaced from each other and a reserrement in the interior of the hollow body downstream these perforated members.

10. A device of the type described comprising a chamber having an aperture at an entrance to said chamber, means for delivering liquid under pressure into said chamber in the form of a jet, inlets to admit air into said chamber, baffle means substantially below said aperture and positioned in a plane approximately perpendicular to the path of said jet and a discharge passage from said chamber.

11. A device of the type described comprising a chamber having a plurality of inlet ports for the introduction of fluids into said chamber, one group of said inlet ports having means connected thereto for supplyig fluid under pressure, said inlet ports having a total cross sectional area substantially less than the cross sectional area of the supply means leading to said group of inlet ports thereby to form jets of fluid to increase the velocity of fluid passing through said ports under pressure and another group of said inlet ports adjacent the aforesaid inlet ports to permit fluid not under pressure to be drawn into said chamber by virtue of the increased velocity of the fluid coursing through the aforesaid inlet ports under pressure, *dividing* ~~baffle~~ means positioned in a plane substantially perpendicular to the path of fluid coursing through the group of inlet ports for fluid under pressure, and a discharge port; the cross sectional area of the discharge port being greater than the sum of cross sectional areas of the inlet ports for fluid under pressure but less than the greatest cross sectional area of the chamber.

12. A device of the type described in claim 11 wherein the inlet ports for the introduction of fluids not under pressure comprise a group of ports for introducing one kind of fluid and another group of ports for introducing another kind of fluid.

13. A device of the type described in claim 11 wherein a screen is placed below the baffle means and is substantially parallel thereto further to subdivide fluid bubbles.

14. A device of the type described in claim 11 wherein projections extend partially into the passages formed by the inlet ports for fluid under pressure and below the inlet ports for fluid not under pressure thereby to effect a partial mixing of fluids before the fluids strike the *dividing* baffle means in the chamber.

15. A device of the character described in claim 11 wherein the inlet ports for fluid not under pressure intersect the inlet ports for fluid under pressure.

OATH

State of New York }
County of New York } ss.

Elie Aghnides, being duly sworn, deposes and says: That he is a citizen of the Greek Republic, and a resident of Brussels, Belgium; that he verily believes himself to

be the original, first and sole inventor of the certain new and useful improvements in FLUID MIXING DEVICES, described and claimed in the annexed specification which discloses and claims certain matters derived from an earlier application filed by him on December 4, 1935, Serial No. 52,923, for "Fluid Mixing Devices in Which One of the Fluids Is Under Pressure"; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in the United States of Ameriea, or any foreign country before his invention or discovery thereof; that he does not know and does not believe that the same, except as to matters disclosed in said application Serial Number 52,923, was patented or described in any printed publication in the United States of America, or any foreign country more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; or patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application and that no application for patent on said invention has been filed by him or his legal representatives and assigns in any country foreign
16 to the United States, except as follows:

Belgium, December 8, 1934.

and in a number of other foreign countries, the exact list of which is not now available to affiant, all of which applications were filed within one year subsequent to the date of the filing of the said Belgian application, but the information regarding the specific dates thereof is not now available to affiant.

Elie Aghnides

Sworn to and subscribed before me this 14th day of December, 1937.

Mary Horacek
Notary Public.

(Seal)

NOTARY PUBLIC
Queens County No. 844
Queens County Register's No. 4334
Certificate filed in N. Y. Co. Clerk's No. 38
New York County Register's No. 9-H-44
Commission Expires March 30, 1939

Note

Page 2 App. 60 is on Card 8.

18 (Mail Division U. S. Patent Office Dec. 31 1937)

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Filed herewith
(U. S. Patent Office Jan 10 1938 Division XXXII.)

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the last rejection of applicant's case, Serial No. 52,923, the Examiner called for the re-writing of the specification. In place of doing this, a continuing application is being filed so as to permit some changes in the drawings and to avoid any issue in regard to new matter.

As regards the claims now submitted, the only reference of importance that previously had been cited is British Patent No. 25,900 of 1909.

Superficially it might appear that this patent shows a structure embodying the principles disclosed by the present applicant, but in fact this is not the case. The essence of applicant's invention is the use of the kinetic energy of the water in the mixing chamber to cause a splashing and splattering which leads to a thorough mixing of the water and the air. An examination of the British
19 patent shows that such an effect will not be had with the structure therein shown. The nozzle e has a very fine aperature at the top and enlarges at the bottom. As a result, the water coming through this nozzle will spread out into a cone. The sleeve f is positioned very close to the nozzle e and is so shaped that the water will tend to move over the face of this sieve with a minimum of splashing action. It is also obvious that the inflow of water must be so controlled that substantially all of the water will be drawn directly through the sieve f and not to be deflected back. If there is more water than will pass through the sieve readily, it would result in filling up the space above this sieve and instead of air being drawn in, the water would back up and go out. This difference is due to the fact that the screen is so arranged that it does not cause an abrupt change in the direction of movement of the water. It is recognized that it might not take many changes to cause the structure of the British patent to operate in a manner similar to that of

applicant, but these changes would demand a recognition of the principles which this applicant has been the first to enunciate and these principles and the changes that would have to be made are in no way suggested by the British patent.

It may aso be noted that the vessel a in this British patent is maintained under vacuum by the action of the very efficient water pump illustrated on the left of the drawing (The pipe g is connected to the unlettered pipe which leads into the sphere in the middle of the apparatus). Because of the vacuum maintained in vessel a air will be positively drawn in through the top of tube b and this will further serve to force water through the sieve f and prevent this water from splashing in the manner which is essential to the operation of applicant's device.

None of the remaining patents are pertinent and therefore they are not discussed in detail.

Of the claims now submitted, Nos. 7, 8 and 9 are substantially similar to former allowed claims 2, 3 and 4 changed only to simplify the form. The remaining claims have been drawn with great care to avoid any objection on the ground of multiplicity of species and to bring out the factors of novelty discussed above.

It is believed that this application is in condition for immediate allowance.

Respectfully submitted,

Dec. 31, 1937

Frank S. Appleman
Attorney for Applicant.

(Application Div. U. S. Patent Office Feb. 17 '30

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 182,884
Filed December 31, 1937
Fluid Mixing Devices
(U. S. Patent Office Division XXXII. Feb 19 1938)

Hon. Commissioner of Patents,
Sir:

In the above entitled application, please enter the following amendment:

Page 3, line 9, cancel "splashing effect" and insert—breaking effect on both liquid and air—.

Lines 18 and 19, cancel "it is splattered into droplets and mixed with air" and insert—both water and air are broken up—.

Line 25, cancel "splattering" and insert—breaking—.

Line 28, cancel "from the apertures to splash back" and insert—and air to be broken up—.

Line 29, cancel "to mix with the air".

Cancel line 30, and insert—finely subdivide the air and the water passing through it. For this—.

Page 4, line 4, cancel "somewhat".

Line 6, cancel "bubbles" and insert—and the water—.

After line 9, insert—But an important feature which I have found absolutely necessary and critical in the use of such baffles, and more particularly with the use of screens or perforated plates, is that the dividing or breaking up effect must be considerable, while the resistance offered by the solid material of the baffle must be as low as possible. This can be obtained by reducing the solid parts remaining among the holes of the perforated plate as much as possible in order that the little streams of water issuing from the holes join immediately each other to form a single jet and not a plurality of jets as it occurs by the use of ordinary perforated plates. Due to this very low resistance of the baffles, the air drawn in by the water passes almost entirely through the holes and, as the water forms a single jet, this air remains imprisoned in the form of air bubbles in the column of water.—.

Page 5, line 10, cancel "splatter back into the chamber and".

Line 11, cancel "thoroughly mixed with the air" and insert,—finely divided—.

Please add the following claims:

—*16* 16. A device according to claim 1, in which the baffle means comprises a perforated plate positioned across the discharge from said chamber, this perforated plate being of such construction that it has a very considerable breaking up effect and that the solid parts remaining among the holes are reduced as much as possible in order to offer a resistance as low as possible and to secure the formation of a single jet at the issue of this perforated plate.

17 16. A device according to claim 6, ~~wherein the perforated member is embedded in a peripherical groove of a rubber connector connecting the casing to the faucet.~~

After the case is allowed, please renumber claim 15 as 5, and claim 16 as 7.

Respectfully submitted,
Elie Aghnides
By Frank S. Appleman
Frank S. Appleman, Attorney

February 17, 1938
A/W
23 Div. 32 Room 4086 PRN/k 5

DEPARTMENT OF COMMERCE

United States Patent Office
Washington

Please find below a communication from the EXAMINER in charge of this application.

Conway P. Coe,
Commissioner of Patents
(Mar 21 1938)

Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.

Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices
As amended Feb. 17, 1938
References:

Felten et al (British) 6,012 A.D. March 12, 1909 261-76 (1 sheet of drawings)
Hoffmann (British 125,809 May 1, 1919 261-76 (specification, 5 pages, drawings, 1 sheet)
Ryles et al (British) 328,924 May 5, 1930 261-76 (specification, 4 pages, drawings, 1 sheet)
Weidmann (British) 25,900 Nov. 9, 1909 261-76 (specification, 2 pages, drawings, 1 sheet)

Claims 1 to 15 are rejected on British patent 25,900 herein as shown at h° a perforated baffle breaks up the mixture of gas and liquid. The liquid nozzle h' also appears to be provided with a transverse screen below it.

The plurality of screens involves no distinction over a single screen.

Claims 1 to 15 are further rejected on Felten et al showing particularly a plurality of sereens for the purpose set forth. No invention is involved in multiplying the liquid ports especially in view of Ryles.

Claims 15 and 16, filed Apr. 17, 1938, are renumbered 16 and 17.

Claim 16 is rejected as functional and indefinite for beyond a mere perforated plate the limitations refer to matters of operation not supported by said plate. The terms are such that no one could pcssibly decide whether they infringed or not. The language "as much as possible", "as low as possible" is especially objectionable. That "single jet is finally formed" is not supported by any of the previously recited structure.

24 Claims 16 and 17 are rejected on the references to claim 1 for like reasons. Claim 17 impositively adds a rubber connector. This, if a part of the alleged invention, must be positively set forth. However, no difference of material will constitute a patentable distinction unless it supplies a novel function not obvious from the known properties of the material.

Claims 1 to 17 are rejected.

PAN

/s/ Fish
Examiner.

Amendment B

25

(U. S. Patent Office Jun 22 1938 Division XXXII
Paper No. Jun 21 1938 Division 89)

In the United States Patent Office

In the application of
Elie Aghnides
Serial No. 182 884
Div. 39
Filed December 31, 1937
Fluid Mixing Devices

Hon. Commissioner of Patents,

Sir;

Replying to the Office Action dated March 21, 1938, please enter the following amendments:

Page 2, line 15, cancel "baffle"
line 17, change "this baffle" into "them"

Page 3, cancel first paragraph and replace by:

"The essential feature of my invention is an arrangement of a dividing means in the path of the liquid emerging from the aperture delivering liquid to the aforesaid chamber, this dividing means being adapted to finely break up the fluids and to imprisons in the liquid air particles forming therein such small bubbles that they remain in suspension in the jet.

It has been suggested to divide the liquid stream under pressure in order to increase the contacting aera between this liquid and the gas; it has also been proposed to divide the stream of liquid and also the gaseous fluid, in order to have a good mixing of both fluids, but in no case, the division has been so fine as to form in the liquid such
26 narrow gaseous bubbles that these latter would remain in suspension in the issuing jet. In the devices suggested until now, the gaseous fluid drawn by the liquid separates immediately at the outlet of the apparatus and no known apparatus has for its object, as this is the case in my invention, the formation of a coherent and "white" jet, this being due to the very fine division of the air and to the formation of a true suspension of a multitude of air bubbles in the water".

Page 3, cancel 6 last lines and insert:
"efficient form of dividing means is a fine screen located at the outlet, and I have found"

Page 4, line 1, cancel "latter reason, I find"
lines 3 to 6, cancel "In that case . . . of the air bubbles" and insert "When more than one of such perforated plates are used, they can be either spaced from each other or superposed, to simplify the construction, in contradistinction with the usually used perforated plates, which must be necessarily spaced from each other to avoid obstruction"

Please insert the new passage entered by the last amendment at line 6, after the following original line 9.

Page 5, last line but 4, before "again" insert:

"This property also is due to the air bubbles in suspension. It must not be confounded with the property of a

jet flowing at high velocity—aerated by an injector or not—which can force a certain amount of air and produce a certain amount of lather. Such lather is formed by large bubbles which explode rapidly. On the other hand, the jet considered has the inconvenience to splash the water"

Page 6, last line, cancel "preferably"

Page 7, cancel lines 4 and 5,

lines 11 and 12, cancel *Here* "More again . . . at 62" and replace by "In this case, a screen 62 is also used in the device"

Pages 8 and 9, cancel last paragraph.

In the claims:

27 Claim 1, cancel lines 7 to 13 and insert:

"means in the path of liquid emerging from said aperture, adapted to finely break up the fluids and to imprison in the liquid air particles forming such small bubbles that they remain in the jet and a passage from said chamber adapted to discharge a jet having a multitude of bubbles in suspension at a velocity substantially less than the"

Claim 5, lines 5 and 6, cancel "and one of . . . of the liquid"

Cancel claims 10, 13 and 15 (now claim 5).

Claim 11, line 14, change "baffle" into "dividing"

Claim 14, last line, change "baffle" into "dividing"

Insert following new claim:

"A structure according to claim 1, in which the outlet of the passage adapted to discharge the jet has a resserrement to help the imprisonment of free air bubbles in the liquid"

Respectfully submitted,
Elie Aghnides
By Frank S. Appleman
Frank S. Appleman, Atty.

June 18, 1938

28

(Letterhead—Department of Commerce)

Please find below a communication from the Examiner in charge of this application.

Conway P. Coe
Commissioner of Patents.

Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.

Mailed Jun 23, 1938

The amendment of June 18, 1938 is not a complete response to the office action of Mar. 21, 1938 wherein each of the claims 1 to 17 was rejected. The amendment changes certain of the claims and cancels others but fails entirely to mention claims 6 to 9, 16 and 17 and to point out any reason for reconsidering the rejection of these or the amended claims, or the new claim 18, as required by Rule 68. Also, it is pointed out that claim 15 added by the amendment of Feb. 19 was renumbered as claim 16 and if applicant intends to cancel this rather than original claim 15, proper direction should be given.

Completion of the response is required on or before Sept. 21, 1938 to prevent a holding of abandonment.

PRN.

Fish
Examiner

29

(Stamp—U. S. Patent Office Sep 22 1938
Division XXXII)

(Mail Division Sep 20 1938 U.S. Patent Office
Paper No. 8, Amendment E.)

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 182,884 Div. 32
Filed Dec. 31, 1937 Room 4086
For Fluid Mixing Devices
Hon. Commissioner of Patents,

Sir:

Responding to the official letter of June 23, 1938 and also to the office letter of Mar. 21, 1938, the above entitled application is hereby amended as follows:

Cancel all claims now in the application and substitute:

—19. Means for intimately mixing a plurality of fluids including a casing having lateral ports admitting fluid intermediate the ends of said casing, said casing having an open upper end adapted for connection to a source of fluid under pressure, means in said casing above the openings of the lateral ports into the casing and constituting a diaphragm having at least one opening for the passage of fluid entering the upper end of the casing, said casing having its lower end open to form an outlet, and foraminous means extending across said casing between the point of entry of the lateral ports and said outlet.

30 20. In a device of the kind described, a casing structure having lateral ports opening into the casing intermediate its ends, said casing having an outlet opening ats upper end and an outlet opening at its lower and, a foraminous diaphragm extending across the casing between the inlet opening at the upper end and the openings of the lateral ports into the casing, and a second foraminous member extending across said casing below the openings of the lateral ports into the casing.

21. In a device of the kind described, a casing structure having lateral ports opening into the casing intermediate its ends, said casing having an inlet opening at its upper end and an outlet opening at its lower end, a foraminous diaphragm extending across the casing between the inlet opening at the upper end and the openings of the lateral ports into the casing, a second foraminous member extending across said casing below the openings of the lateral ports into the casing, and a third foraminous member spaced above the second foraminous member and below the openings of the lateral ports into the casing.

22. In a device of the kind described, a lower casing member having an outlet at its lower end, an upper casing member of elastic material and having a lower end portion extending downwardly into the top of the lower casing member and provided with channels extending longitudinally of said lower part to form air inlet ports, said upper member having a centrally disposed upwardly opening inlet and further having a chamber surrounding said
31 inlet in port communication with the lower part of the upper member, a foraminous diaphragm extending across said upper member adjacent its lower end, and a

second foraminous diaphragm extending across said lower member adjacent its outlet.

23. In a device of the kind described, a casing including a lower member provided with an axial outlet at its lower end and a peripheral external shoulder at its upper end, an upper internal screw threaded member provided with an internal shoulder at its lower end engaging beneath said external shoulder, a foraminous diaphragm resting on top of the lower member, said lower member having lateral ports below said upper member, and foraminous means extending across the lower member between said ports and said outlet.

24. In a device of the kind described, a casing having an axial opening therethrough, said opening having its upper end enlarged to form an internal shoulder with relation to its lower end, said upper end being internally screw threaded, a foraminous diaphragm resting on said shoulder, a second foraminous diaphragm extending across said opening between the first diaphragm and the lower end of the opening, and lateral ports opening through said casing into the space between said diaphragms.

25. Means for intimately mixing a plurality of fluids including a casing having lateral ports admitting fluid intermediate the ends of said casing, said casing having an open upper end adapted for connection to a source of fluid under pressure, means in said casing above the openings of the lateral ports into the casing and constituting a diaphragm having at least one opening
32 for the passage of fluid entering the upper end of the casing, said casing having its lower end open to form an outlet, and foraminous means extending across said casing between the point of entry of the lateral ports and said outlet, said outlet from said casing being adapted to discharge the mixture at a velocity substantially less than the velocity of liquid entering said inlet.—

REMARKS

In order to avoid any objection that the Official Letters above noted have not been fully answered, it has been deemed best to cancel all claims in the case and substitute the new claims as above inserted.

These claims are believed to be patentable. A careful inspection of the references cited fails to show any structure having a casing with upper and lower diaphragms

and ports leading from the space between the diaphragms to the exterior of the case. Each and every one of the forms of the invention herein shown has exactly this construction and each of the claims brings in this peculiar differentiation from the references. It is submitted that with this type of construction, the inflowing water stream is broken up in such manner that it more readily entrains the air entering through the lateral ports and then as the mixed air and water passes through the lower diaphragm, what may be termed a fine emulsion of the air in the water results.

None of the reference structures provide for this breaking up of the air to mix with the water in the chamber and then the emulsifying of this mixture.

33 In view of the foregoing, it is thought that allowance should be had of these claims.

Respectfully submitted,
Elie Aghnides
By Frank S. Appleman,
Frank S. Appleman, Attorney.

A*G*
Sept. 20, 1938

34

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Please find below a communication from the Examiner in charge of this application.

Conway P. Coe
Applicant: Elie Aghnides
Filed Dec. 31, 1937
Ser No. 182,884
For Fluid Mixing Devices

Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.

As amended Sept. 20, 1938.
Reference added:

Aghnides (British) 468,687 July 6, 1937
(specification, 2 pages, drawings, 1 sheet)

This application is found to contain claims to four distinct species of invention of which (I) claim 21 reads

claim is specific to fig. 4, (IV) claim 24 covers figs. 2, on figs. 4 and 5, (II) claim 22 reads only on fig. 1, (III) Claim 23 is specific to fig. 4, (IV) Claim 24 covers figs. 2, 5 and 6. In accordance with Rule 41 election of a single species is required. Claims 19, 20 and 25 appear to be generic to each of the above mentioned species.

Claims 19, 20 and 25 are rejected on Weidmann, British patent 25,900 or Felton as applied in the last office action. Claims 19 and 20 fail to set forth the nature of the fluid media and hence are merely to a few conventional elements having no particular function. As shown, however, the perforated element through which the liquid must pass merely restricts its flow without modifying its condition.

Claims 19, 20 and 25 are further rejected on British patent 468,687 to Aghnides which since filed more than a year prior to this application is a proper reference. The restricted outlet, claim 25, merely retards the flow and has nothing to do with mixing the fluids.

Claims 21 to 24 are rejected for misjoinder of invention.

Claims 1 to 18 are cancelled.

Claims 19 to 25 are rejected.

PRN.

Fish
Examiner.

35

Stamp
U. S. Patent Office
May 10 1939
Division XXXII.

Mail Division
May 8 1939
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 182,884 Div. 32
Filed Dec. 31, 1937 Room 4086
For Fluid Mixing Devices
Hon. Commissioner of Patents,

Sir:

In reply to the Office letter of Nov. 17, 1938, it is to be understood that the specification particularly sets forth that this case is a "continuation in part of my earlier application Serial No. 52,923".

The Examiner has rejected claims 19, 20 and 25 in part because of applicant's said prior application of which this is a continuation. Obviously, therefore, the Examiner cannot properly reject the present application on a British patent which covered the prior application. The Supreme Court has held that an invention dates from the time the inventor completes it in his mind. This is brought out in O'Reilly v. Morse 15 Howe (56 U.S.) 62,109 and in Loom Co. v. Higgins, 105 U.S. 580.

Furthermore, the prior patent issued in England to the present applicant cannot be held an anticipation, since the application now pending is "a continuation in part" of the prior application.

36 Please add the following claims:

26. A device for intimately mixing at least two fluids *one being liquid and the other gases*, one of which is under ressure, comprising in combination a hollow cylindrical body connectable to a delivery pipe of fluid under pressure, means for dividing the stream of fluid under pressure, a passage-way down stream said means in the wall of said body for the admission of fluid to be mixed to the fluid under pressure, and means down stream this passage for obliging both fluids to mix together before leaving the hollow body, the cross section area of the body at the point where said passage is made and the cross section area of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

27. A device for intimately mixing at least two fluids, *one being liquid and the other gases*, one of which is under pressure, comprising in combination a hollow cylindrical body connectable to a delivery pipe of fluid under pressure, means for dividing the stream of fluid under pressure, a passage-way down stream said means in the wall of said body for the admission of a fluid to be mixed to the fluid under pressure, and means down stream this passage for obliging both fluids to mix together before leaving the hollow body, the cross section area of the body at the point where said passage is made and the cross section area of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage, the means for obliging the fluids to

Lax together comprising at least two perforated
37 plates up stream the escape opening of the hollow body, these plates being spaced from each other.

28. A device for intimately mixing at least two fluids, *one being liquid and the other gases*, one of which is under pressure, comprising in combination a hollow cylindrical body connectable to a delivery pipe of fluid under pressure, means for dividing the stream of fluid under pressure, a passage-way down stream said means in the wall of said body for the admission of a fluid to be mixed to the fluid under pressure, and means down stream this passage for obliging both fluids to mix together before leaving the hollow body, the cross section area of the body at the point where said passage is made and the cross section area of the body immediately down stream this passage being both larger than the free streaming section for the fluid under pressure immediately up stream said passage, the means for obliging the fluids to mix together comprising at least two perforated plates up stream the escape opening of the hollow body, these plates being spaced from each other, and a resserrement in the interior of the hollow body down stream these perforated plates.—

The foregoing claims are allowed claims 2, 3 and 4 in applicant's case, Ser. No. 52,923.

Also, please add the following claims:

29. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means for dividing the liquid entering said hollow body, a passage
leading into such hollow body for the admission of air
38 through the suction of the liquid, means in the path of liquid emerging from said dividing means for obliging both fluids to mix together, and a passage from said hollow body adapted to discharge the fluids mixed.

30. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means comprising a plurality of apertures for dividing the liquid entering said hollow body.

31. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means for di-

viding the liquid entering said hollow body, a passage leading into such hollow body for the admission of the air through the suction of the liquid, foraminous means in the path of liquid emerging from said dividing means, for obliging both fluids to mix together, and a passage from said hollow body adapted to discharge the fluids mixed.

32. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means for dividing the liquid entering said hollow body, a passage leading into such hollow body for the admission of the air through suction of the liquid, means in the path of liquid emerging from said dividing means for obliging both fluids to mix together, said means comprising at least one perforated member.

39 33. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means for dividing the liquid entering said hollow body, a passage leading into such hollow body for the admission of the air through the suction of the liquid, means in the path of liquid emerging from said dividing means, for obliging both fluids to mix together, said means comprising at least two perforated members, said members being spaced from each other.

34. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapatd for connection to a source of liquid under pressure, means for dividing the liquid entering said hollow body, a passage leading into such hollow body for the admission of the air, through the suction of the liquid, means in the path of liquid emerging from said dividing means, for obliging both fluids to mix together, and a passage from said hollow body adapted to discharge the fluids mixed, and a resserrment in the interior of the hollow body downstream said mixing means.

35. A device for mixing at least a liquid under pressure and air, comprising a hollow body adapted for connection to a source of liquid under pressure, means comprising a plurality of apertures for dividing the liquid entering said hollow body, and a resserrement in the interior of the hollow body downstream said mixing means.

40 36. A device of the type described comprising a chamber, an aperture to admit liquid into such cham-

ber, means for delivering to such aperture liquid under pressure, a passage leading into such chamber for the admission of air, means in the path of liquid for obliging both fluids to mix together, and a passage from said chamber adapted to discharge the fluids mixed, the liquid being admitted into such chamber through a plurality of apertures formed in a removable screen.

37. A device of the type described comprising a chamber, an aperture to admit liquid into such chamber, means for delivering to such aperture liquid under pressure, a passage leading into such chamber for the admission of air, means in the path of liquid for obliging both fluids to mix together, and a passage from said chamber adapted to discharge the fluids mixed, the mixing means comprising at least a screen positioned across the discharge from said chamber.

38. A device of the type described comprising a chamber, an aperture to admit liquid into such chamber, means for delivering to such aperture liquid under pressure, a passage leading into such chamber for the admission of air, means in the path of liquid for obliging both fluids to mix together, and a passage from said chamber adapted to discharge the fluids mixed, the liquid being admitted into such chamber through a plurality of apertures formed in a removable screen, and the mixing means comprising at least a screen positioned across the discharge from said chamber.

41 39. In combination with a water faucet, a casing adapted to be attached to such faucet, a member with perforations held across the mouth of such faucet by such casing, a chamber below such screen, air passage leading into such chamber whereby air may be drawn into such chamber by the action of water emerging from said screen, an outlet from said chamber, and a mixing means across said outlet for obliging both means to mix together, and a discharge for the mixed fluids.

40. In combination with a water faucet, a casing adapted to be attached to such faucet, a member with perforations embedded in a peripheral groove of a rubber connector connecting the casing to the faucet, a chamber below such screen, air passage leading into such chamber whereby air may be drawn into such chamber by the action of water emerging from said screen, an outlet from said

chamber and a mixing means across ~~said~~ outlet for obliging both means ~~to mix~~ together, and a discharge for ~~the mixed~~ fluids.

REMARKS

The previously allowed claims to applicant are generic to each of the species cited by the Examiner. Nevertheless, applicant is willing, if the Examiner requires, to limit the species claimed, and only for the purpose of meeting the requirements of the patent practice he agrees to restrict his invention, if necessary, to that class covered in general by Claim 24.

Applicant has also added new claims 29 to 40 for the consideration of the Examiner.

42 It is not thought advisable at the present time to cancel any figures from the drawing, but in the event that the Examiner refuses to admit the new claims, such figures as are not required will be canceled.

Respectfully submitted,
E. Aghnides
By Frank S. Appleman
Frank S. Appleman, Atty.

A•G•L
May 8, 1939

43

(Letterhead—Department of Commerce)

Please find below a communication from the Examiner in charge of this application.

Conway P. Coe
Commissioner of Patents.
Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices
Mailed May 11 1939

Frank S. Appleman,
1331 G. St., N. W.,
Washington, D. C.

The amendment of May 8, 1939 is not a complete response to the Office action of Nov. 17, 1938. Applicant has made no response to the rejection of claims 19, 20 and 25 on the references mentioned in paragraph 2 of that

action. Also applicant has inserted a large number of claims without making the least effort to point out how they avoid the rejection on references or on misjoinder. The former ground of rejection requires that applicant distinguish the subject-matter of the claims from the references. The latter ground requires that applicant point out on which of the several species each of the claims reads. Moreover, the number of claims is on its face unreasonable and it is incumbent on applicant that good reasons be stated therefor.

The amendment must be supplemented to constitute a complete response on or before May 17, 1939.

Fish
Examiner.

PRN

44 #16 72/E

(Mail Division May 16 1939 U. S. Patent Office)
(U. S. Patent Office May 18, 1939 Division XXXII.)

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 182,884 Div. 32
Filed Dec. 31, 1937 Room 4086
For Fluid Mixing Devices

AMENDMENT.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the above application and referring to the Office letter of May 11, 1939 exception is taken to the statement set forth that no response has been made to the rejection of claims 19, 20 and 25 on the references mentioned in paragraph 2 of that action. It is excepted that when claims have been allowed, as in the prior application #52923 this constitutes a bar against the Examiner rejecting on former references.

It is believed that the Examiner, after allowing claims, is within his rights to cite new references.

Nevertheless, the references mentioned in paragraph 2 of the Office action of November 17, 1938 will be considered.

Now neither of these references have been shown by the Examiner to meet the terms of claims 19, 20 and 25. All the Examiner states is that these claims are rejected on Weidmann, British patent 25,900 or Felton as applied in the last Office action. Now this is set forth in paper #9. Let us return therefore to Paper #7. Note that the Examiner has rejected on the references on Weidmann or Felton as applied in the last Office [action. This is set forth in Paper #9. In Paper #7, the Office action does not mention claims 19, 20 or 25 nor does this Office action show any grounds for "rejection of claims 19, 20 and 25 or Weidmann or Felton as applied in the last Office] action" since the last Office action of June 23, 1938 fails to
45 reject the said claims 19, 20 and 25 on any grounds.

In view of the foregoing it is requested that the Examiner state how the claims, 19, 20 and 25, previously allowed, can be rejected on Weidmann or Felten "as applied in the last Office action" since the previous Office action of June 23, 1938 did not apply either of the references now cited in the Office action of November 1., 1938.

In a conversation with the Examiner and Principal Examiner, it is believed that the rejection of claims, 19, 20 and 25, resulted in a conclusion there there was an error in the rejection of these claims on the patent (British) 468,687 to Aghnides., the present inventor.

It is submitted that the invention is not on the separation or combination of gases and liquids. Nevertheless applicant is willing at this time to limit his claims to a device for combining gases and liquids and therefore the following amendment is made.

In Claim 26, Claim 27, and Claim 28, line 2 of each claim after "fluids", insert—one being liquid and the other gases—.

Cancel Claims 29 and 30.

Cancel Claim 32.

Cancel Claims 34 to 40.

Now Claim 35 is based on the same subject matter as the claims allowed in the prior application. Therefore Claim 35 covers all of the forms covered being the previously allowed claims of 19, 20 and 25.

The number of the claims is therefore restricted and cannot be said to be unreasonable.

Now add the following claim:

— 41. In a device of the kind described, a flexible member consisting of an upper part provided with an elastic collar having interior and exterior walls spaced to provide an air section of circular form, said interior wall being adapted to fit on the nozzle forming the outlet of a water supply, a perforated diaphragm extending across the
46 bottom of said elastic member, a cylindrical nozzle fitted on the lower part of said elastic member, a perforated diaphragm located adjacent and within the lower end of said nozzle, and a restricted outlet at the lower end of said nozzle.—

Applicant has now restricted the number of claims and has brought the device down to that shown in Figure 1. Certainly therefore there is nothing in this figure that is illustrated by the references and accordingly allowance is thought due.

It is believed that the foregoing clearly responds to the last Office action.

Respectfully submitted,
E. Aghnides
Frank S. Appleman
By Frank S. Appleman, Atty.

A·G·L
May 16, 1939

47

Department of Commerce
United States Patent Office
Washington

Please find below a communication from the Examiner in charge of this application.

Conway P. Coe
Commissioner of Patents

Frank S. Appleman,
1331 G St., N. W.,
Washington, D. C.

Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

(Mailed Jul 14 1939)

As amended May 16, 1939.

Applicant having in amendment of May 8, 1939 elected to prosecute claims of the same scope as claim 24, that is,

to figs. 2, 5 and 6, claims 21, 22, 23, 26, 27, 28, 33 and 41 are rejected on the ground that applicant is estopped to prosecute these claims in this application. Claims 21, 23 and 33 read only on fig. 4, while claims 22, 26 to 28 and 41 cover fig. 1 exclusively.

Claims 19, 20 and 25 are rejected on Weidmann or Felten et al as applied in the first and second office actions, papers nos. 5 and 9. Applicant has failed to distinguish these claims from these references. The argument based on the alleged allowance of claims in the original application, of which this is a continuation in part, is of no avail to applicant for the reason that in none of these office actions were claims allowed. Certain claims were at one time referred to as apparently including allowable subject-matter, but then and subsequently all the claims were rejected as indefinite and as so informal as not to permit application of art. It was therefore entirely proper that such claims were rejected in this application and that rejection is accordingly adhered to.

Claims 24 and 31 are rejected on the reference to claim 19 for like reasons. The mode of attaching the device,
48 claim 24, involves no more than ordinary skill and choice, especially as the elements of Felten are secured in a similar way. Claim 31 covers the broad generic construction and such involves no invention over the references.

Claims 1 to 18, 29, 30, 32, and 34 to 40 are cancelled.

Claims 19 to 28, 31, 33 and 41 are FINALLY rejected.

Fish
Examiner

PRN

49

(U. S. Patent Office Dec 12 1939 Division XXXII)
(Mail Division Dec 12 1939 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

In the application of
Elie Aghnides
Serial No. 182,884 Div. 32
Filed Dec. 31, 1937 Room 4086
For Fluid Mixing Devices
Hon. Commissioner of Patents,

Sir:

Responding to the official letter of July 14, 1939, the above entitled application is hereby amended as follows.

Cancel the claims and substitute:

—42. In a device for producing a jet of water containing air bubbles, by the entrainment and mixture of the air to the water flowing under pressure, a casing having a passage therethrough, the inlet end of which is adapted for connection to a source of water under pressure and the outlet end for discharging the air-water mixture, an upstream and a downstream foraminous part extending across the passage and spaced from each other, the said casing having an air admitting opening between said foraminous parts.

43. The device of claim 42 wherein the upstream foraminous part is a sieve and the downstream foraminous part is another sieve, the aggregate cross sectional area of the foramina of the latter being greater than the aggregate cross sectional area of the foramina of the upstream foraminous part.

44. The device of claim 42 wherein the downstream foraminous part is a fine wire mesh screen.

45. The device of claim 42 wherein the downstream foraminous part is a plurality of wire mesh screens spaced from each other.

46. The device of claim 42 wherein the foraminous parts are removable.

47. The device of claim 42 wherein the interior of the casing is contracted in its cross section between the downstream foraminous part and the said outlet end.

48. The device of claim 42 wherein the interior of the casing continues beyond the downstream foraminous part and terminates in a tubular portion extending from the said downstream foraminous part to said outlet end.

49. The device of claim 42 wherein there are a plurality of the air admitting openings extending from the inlet end of the casing toward the outlet end to open laterally circumferentially spaced intervals between the upstream and the downstream foraminous parts.

50. The device of claim 42 wherein there are a plurality of the air admitting openings extending radially through the casing wall at circumferentially spaced intervals between the upstream and the downstream foraminous parts.

51. The device of claim 42 wherein the inlet end is adapted to be screwed to a faucet and the removable upstream foraminous screen is held in position across the mouth of such faucet by such screwing of the casing.

51 52. In a device for producing a jet of water containing air bubbles, a casing having a passage therethrough, the inlet end of which is adapted for connection to a source of water under pressure and the outlet end for discharging the air and water mixture, an upstream and a downstream foraminous part extending across the passage and spaced from each other, the casing having an air admitting opening between said foraminous parts, and in which for a known flow of water under pressure through the upstream foraminous part, the retardation of the flow of water under pressure by the downstream foraminous part effects the mixing of air and water, the mixture leaving the casing in the form of a coherent stream.

53. In a device for forming a coherent stream of mixed air and water, a casing having a passage therethrough, the inlet end of which is adapted for connection to a source of water under pressure and the outlet end for discharging the air and water mixture, an upstream and a downstream foraminous part extending across the passage in spaced relation to each other, the said casing having air admitting opening between the said foraminous parts, the foramina in the said elements being so proportioned and seated as to effect the entrainment and mixing of the air with the water, the mixture leaving the casing in the form of a coherent stream.—

REMARKS

Claims 52 and 53 are of a type somewhat on the order of the gekennzeichnet claim. Authority for claims of this kind is found in the citations under Section 5604 of "Patent Claim Drafting" by Stringham.

Claim 53 has an introductory statement as to the formation of the "coherent stream" and then recites
52 the elements and the relation of parts necessary in applicant's invention to produce this result.

Claim 52 is characterized by the inclusion of related parts for producing the coherent stream.

Plaintiff's Exhibit 15.

2 App. 38

Fig. 8

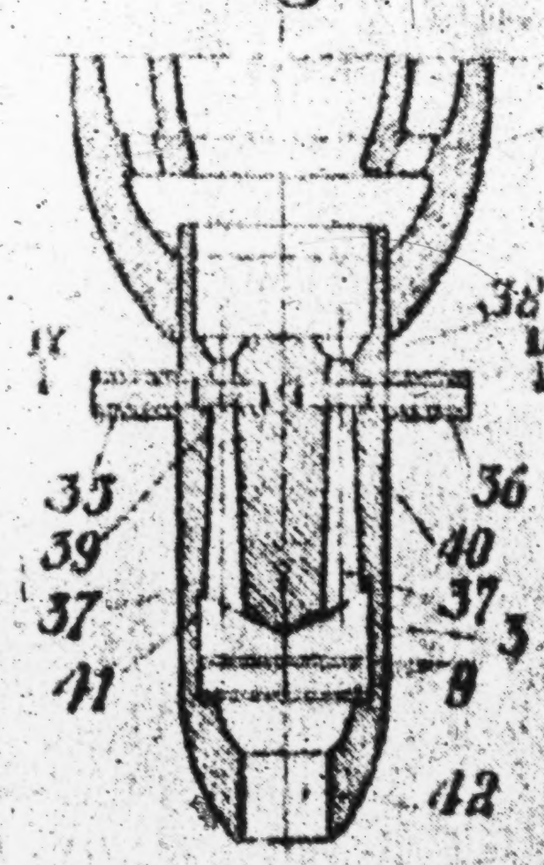
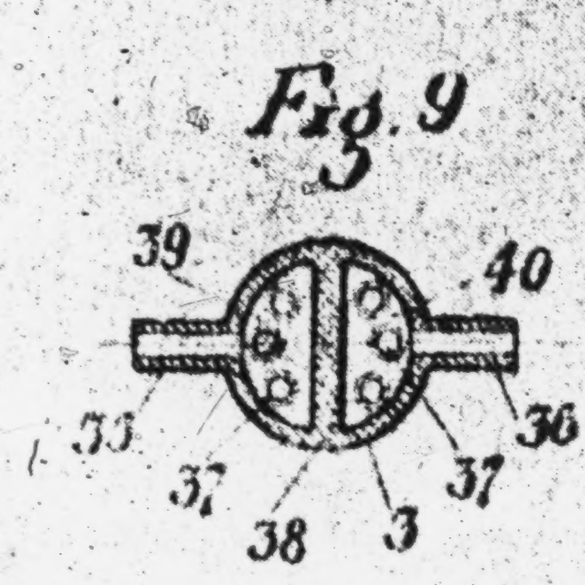


Fig. 9



518

PLAINTIFF'S EXHIBIT NO. 16 2 App. 49

PATENTED BY
TURN TO RECORD FROM
NUMBER (Sec.) of 19 37

1937

182884
DIV. 3 4 32
4 0

PATENT NO. 2210849

DATED AUG 6 1940

(EX'R'S BOOK) 1106
28

Name ELIE AGHNIDES

To:

of ~~BRUSSELS~~, [illegible]

State of ~~BELGIUM~~, [illegible]

Invention FLUID MIXING DEVICES

ORIGINAL	RENEWED
APPLICATION FILED COMPLETE DEC 31, 1937	
PARTS OF APPLICATION FILED: *Petition, Specification, Oath, First Fee $30* / *1 sheets Drawings,* — DEC 31, 1937	
Examined and passed for Issue JUN 25 1940, 19	*Reexam'd and passed for Issue*, 19
Exr. Div. [illegible]	*Exr. Div.*
Notice of Allowance JUN 29 1940, 19	*Notice of Allowance*, 19
Final Fee $30 July 11, 1940; 19	*Final Fee*, 19
By Commissioner	*By Commissioner.*

Division of Apps., No.

Attorney FRANK S. APPLEMAN 1331 G ST N.W. CITY

(Ex Office) John Boyle, Jr. 801 Washington L. & T. Bldg. City

Address

Associate Attorney

No. of Claims Allowed 5 *Print Claims* 1 *in O. G. Class* 261-26

Title as Allowed Fluid Mixing Device

BELGIUM DEC 8, 1934 E.C.

2 App. 60

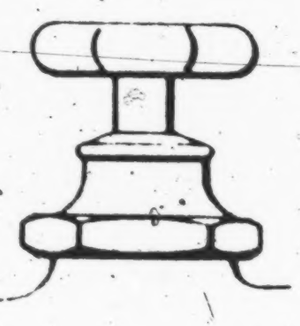
PLAINTIFF'S EXHIBIT NO. 16

17

182884

Print

Fig. 1.



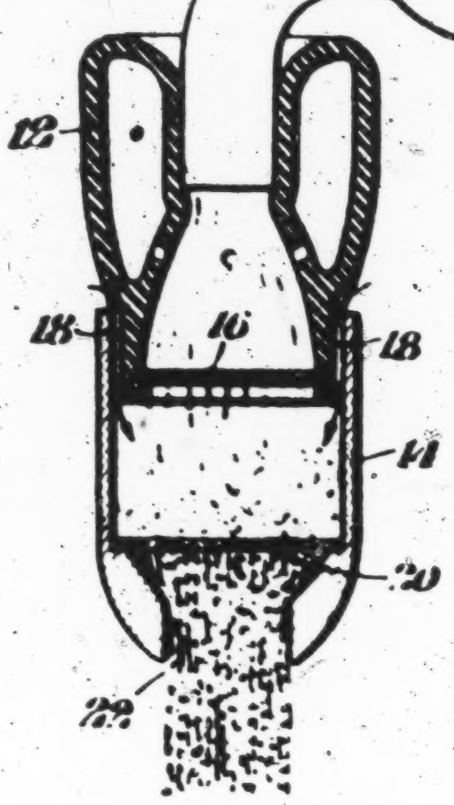


Fig. 2.

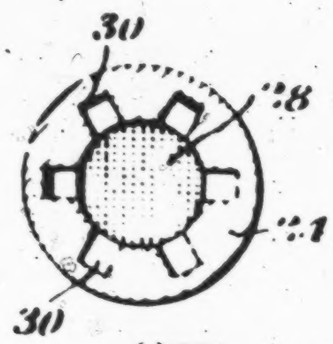


Fig. 1.

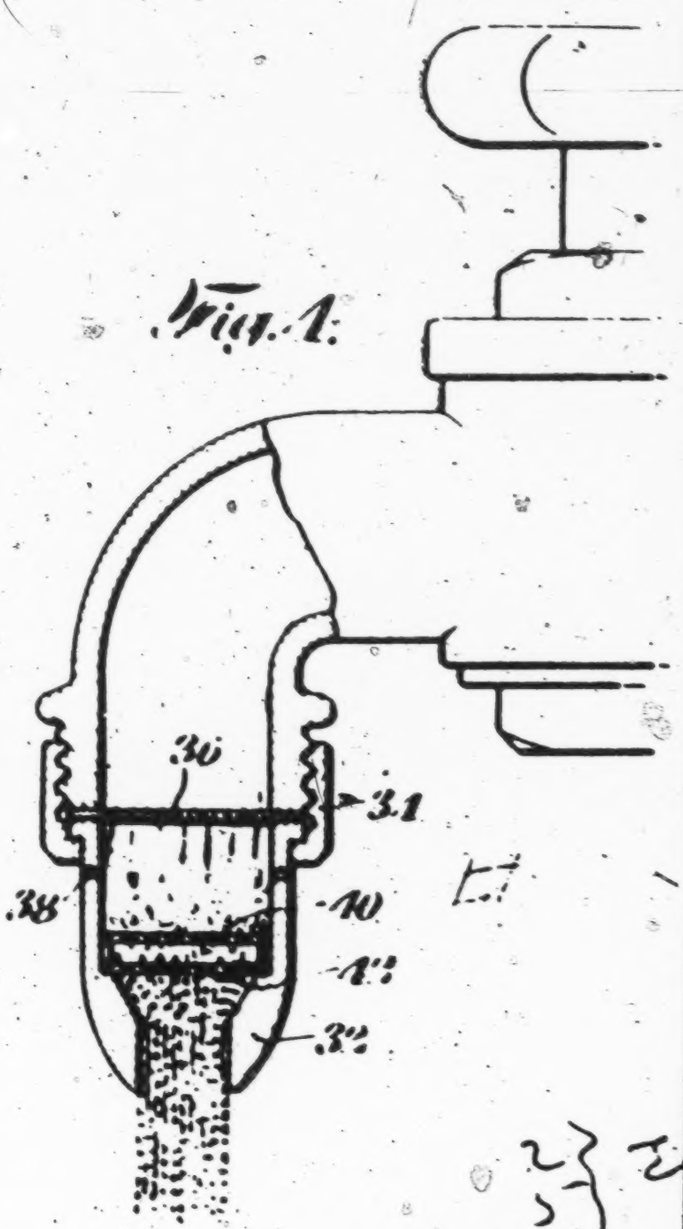


Fig. 3.

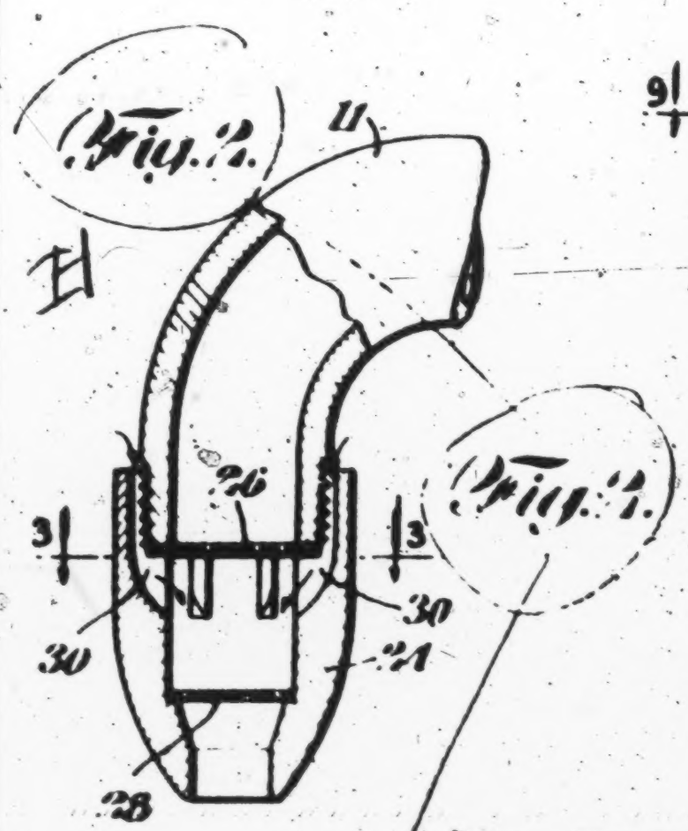


Fig. 4.

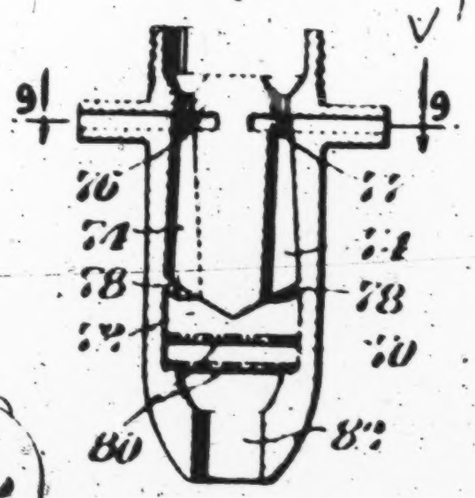


Fig. 5.

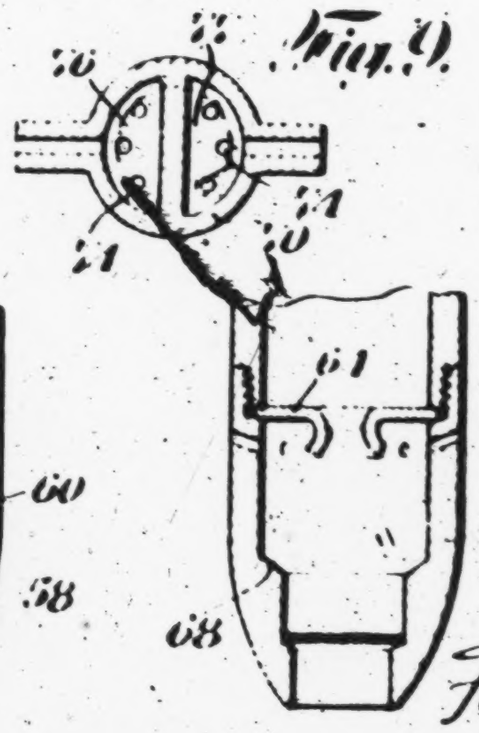


Fig. 6.

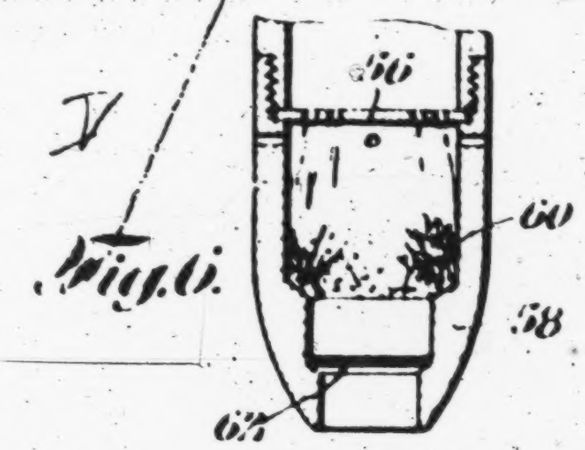
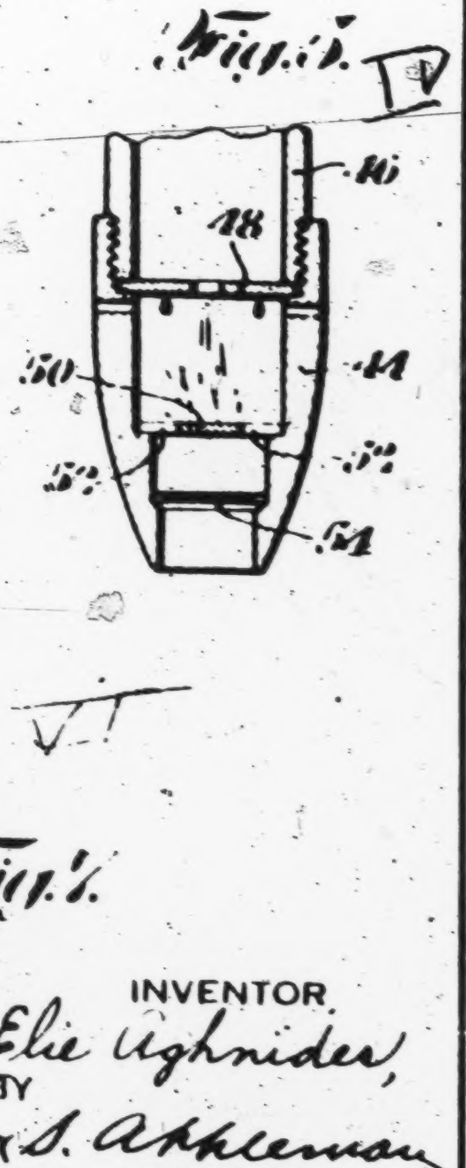


Fig. 7.

Fig. 8.



INVENTOR
Elie Aghnides,
BY
Frank S. Ackerman
ATTORNEY

Plaintiff's Exhibit 16 2 App. 137

COMMISSIONER
JUL 26 1950
OF PATENTS

Form 789

UNITED STATES DISTRICT COURT
District Court of the United States
DISTRICT OF NORTHERN ILLINOIS - EASTERN DIVISION

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of Eebruary 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 19th day of July, 1950 in this court an action, suit, or proceeding No. 50 C 1022, entitled:

Name ELIE P. AGHNIDES, Plaintiff,
Address 46 West 54th Street, New York 19, N.Y.

versus

Name ORLOFF W. HOLDEN and MARGUERITE HOLDEN, a corp., d/b/a KNICKERBOCKER RUBBER COMPANY, Defendant,
Address 6101 S. May Street, Chicago 21, Illinois

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	August 6, 1940	Elie P. Aghnides
2			
3			
4			
5			

In the above-entitled case, on the day of 19..., the following patents have been included by answer, cross bill, or other pleading:

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree entered:

.....

.....

IN WITNESS WHEREOF I have affixed my hand this 24th day of July, 1950, at Chicago, Illinois.

ROY H. JOHNSON
Clerk of said Court

By .....

2 App. 138 Plaintiff's Exhibit 16

FORM 730

UNITED STATES DISTRICT COURT

~~District Court of the United States~~

DISTRICT OF NORTHERN ILLINOIS - EASTERN DIVISION

COMMISSIONER

SEP 19 1950

OF PATENTS

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 17th day of August, 1950, in this court an action, suit, or proceeding No. 50 C 1178, entitled:

Name ELIE P. AGHNIDES, Plaintiff,

Address 46 W. 54th St., N.Y. 19, N.Y.

versus

Name JOSEPH J. GOODRIE and WRIGHTWAY ENGINEERING COMPANY, Defendant,

Address 1053 E. 43rd St., Chicago, Ill; 1053 E. 43rd St., Chicago, Ill.

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	August 6, 1940	Elie P. Aghnides
2			
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

IN WITNESS WHEREOF I have affixed my hand this 18th day of September, 1950 at Chicago, Illinois

ROY H. OHLSON

By

U. S. GOVERNMENT PRINTING OFFICE 7—2016

Form 789

District Court of the United States

DISTRICT OF Middle District of North Carolina

COMMISS...

MAR - 2 1953

OF P...

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 3rd day of March, 1953, ~~1953~~, in this court an action, suit, or proceeding No. 728 G., entitled:

Name Elie P. Aghnides, Plaintiff,

Address 46 West 54th Street, New York 19, New York

versus

Name The Meyer's Company, Defendant,

Address Greensboro, North Carolina

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	Aug. 6, 1940	Elie P. Aghnides
2	2,316,832	April 20, 1943	Elie P. Aghnides
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this 3rd day of March, 1953, ~~1953~~, at Greensboro, North Carolina

Henry Reynolds
Clerk of said Court.

By [signature]
Deputy Clerk

U. S. GOVERNMENT PRINTING OFFICE 2016

 Plaintiff's Exhibit 16

FORM 100

UNITED STATES DISTRICT COURT
District Court of the United States

DISTRICT OF NORTHERN ILLINOIS — EASTERN DIVISION

COMMISSIONER

MAR 2[illegible] 1953

OF PATENTS

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 27th day of August, 1950, in this court an action, suit, or proceeding No. 50 C 1178, entitled:

Name Elio P. Aghnides, Plaintiff,

Address 46 W. 58th St., N.Y., 19, N.Y.

versus

Name Joseph J. Goodell and Wrightway Engineering Company, Defendant,

Address 1053 E. 43rd St., Chicago, Ill; 1053 E. 43rd St., Chicago, Ill.

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1 2,210,046	August 6, 1940	Elio P. Aghnides
2		
3		
4		
5		

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued: Complaint of plaintiff dismissed for want of equity. Defendants' Counterclaim for Declaratory Judgment that the Aghnides patent No. 2,210,046 is invalid and void, is sustained. That defendants recover their costs to be taxed in this action and that execution issue therefor.

IN WITNESS WHEREOF I have affixed my hand this 5th day of March, 1953, 193 , at Chicago, Ill.

Roy H. Ellwood
Clerk of said Court.

By Ezell Bartholomew
Deputy Clerk

U. S. GOVERNMENT PRINTING OFFICE 7—3016

182884-117

Plaintiff's Exhibit 16 2 App. 141

AO Form 120

United States District Court
for the
Southern District of New York

In Re Patents
COMMISSIONER
1953
OF PATENTS

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 3rd day of June, 1953, in this court an action, suit, or proceeding No. Civ. 85-272, entitled:

Name Marshall Metal Products Inc. (New York), Plaintiff,

Address The Meyer's Company (North Carolina)

versus

Name Elio P. Aghnides, Defendant,

Address New York

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1 2,210,846	Aug. 6, 1940	To deft.
2 2,316,832	Apr. 20,1943	" "
3		
4		
5		

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

.....,
Clerk.

Date June 3rd, 19 53. By .....,
Deputy Clerk.

Plaintiff's Exhibit 16

FORM 70

UNITED STATES DISTRICT COURT

District Court of the United States

DISTRICT OF NORTHERN ILLINOIS - EASTERN DIVISION

COMMISSIONER OF PATENTS

APR 20 1954

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 17th day of August, 1950, in this court an action, suit, or proceeding No. 50 C 1178, entitled:

Name ELIE P. AGHNIDES, Plaintiff,

Address 46 W. 54th St., N.Y. 19, N.Y.

versus

Name JOSEPH J. GOODRIE and WRIGHTWAY ENGINEERING COMPANY, Defendant,

Address 1053 E. 43rd St., Chicago, Ill; 1053 E. 43rd St., Chicago, Ill.

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	August 6, 1940	Elie P. Aghnides
2			
3			
4			
5			

In the above-entitled case, on the day of , 193 , the following patents have been included by (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued: /Complaint of plaintiff dismissed for want of equity. Defendants' Counterclaim for Declaratory Judgment that the Aghnides patent No. 2,210,846 is invalid and void, is sustained. That defendants recover their costs to be taxed in this action and that execution issue therefor.

IN WITNESS WHEREOF I have affixed my hand this 16th. day of April 1954, 193 , at Chicago Ill inois.

Roy W. Johnson
Clerk of said Court.

By , Deputy Clerk

U. S. GOVERNMENT PRINTING OFFICE 7--2016

* Notice of appeal to U.S.C.A. filed 5-7-53
* Filed Mandate from U.S.C.A. Judgment entered March 30, 1954 A. D.

Form 789

District Court of the United States

DISTRICT OF [redacted]

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SOLICITOR

AUG 5 - 1954

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 6th day of July U. S. PATENT OFFICE, 19[redacted], in this court an action, suit, or proceeding No. 857-G, entitled:

Name [redacted] Aghnides, Plaintiff,

Address New York 19, N. Y.

versus

Name [redacted] & Co., Defendant,

Address Green[redacted], N. C.

brought upon the following patents:

B

	PATENT NO.	DATE OF PATENT	PATENTEE
1	[redacted]	August [redacted], 1940	[redacted]
2	[redacted]	[redacted] 8, [redacted]43	[redacted]
3			
4			
5			

In the above-entitled case, on the day of , 193 , the following patents have been included by (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this [redacted] day of

[redacted], 19[redacted] at [redacted]

[redacted] 7 2016

Clerk of said Court.

Billy W. Herrington

By

At Section 5602 of the Stringham authority, it is stated that no particular form is required for a patent claim and in support thereof, Jepson 242 O.G. 525 and Markush 340 O.G. 839 were cited as authority, and in Brown *vs.* Gill 90 U.S. 181 cited under Section 5602, it was held that no particular form of words is necessary if the meaning is clear, so that these claims 52 and 53, it is submitted, should be favorably considered. These two claims and claim 42 are not different to any marked degree, yet it has been held that applicant is entitled to couch his claims in different verbiage so long as there is not a multiplicity of claims. Ex parte Clark 497 O.G. 549 sanctions writing claims to the same invention in different phraseology and of course the types of these claims are somewhat different, one from the other, so that they may be considered under the decisions cited. However, if these three claims in different verbiage were considered as being a multiplicity of claims, it is hoped that claim 42 shall be favorably considered, the meaning being clear and the claims 43-51 being in order for favorable consideration also. Claims 43-51 which depend from claim 42 can also be easily considered after the merits of claims 52 and 53 are determined.

It is believed that claim 42 is of the type recognized as proper, the inclusion of "by the entrainment and mixture of the air to the water flowing under pressure" making clear the structural relations of parts, the characteristics of which are well known under the name of
53 Venturi tube or Injector effect. The inclusion of the above phrase in claim 42 complies, therefore, with the requirement referred to by the Examiner, making the structural differences and combination of claim 42 sufficiently definite, although authority is found for the allowance of claims including functional statements. Such claims are referred to at Section 5625 of Stringham's "Patent Claim Drafting" citing as authority Telephone Cases 126 U.S. 1, 43 O.G. 377; Bush v. Jones, 184 U.S. 598. The Bush case was cited by Stringham because it was referred to by the Assistant Commissioner Clay in his decision on the Jepson type of claim. Claims have not always been sustained by Courts upon the basis of introductory expression, but if there is a chance that such claim may be sustained, it is suggested as justification for allowance.

The Court of Customs and Patent Appeals in their decision in re: Kamrach 65 F. 2d, 298 reversed the unfavorable decision of the Board of Appeals and said:

"Appellant is entitled to have any doubt resolved in his favor."

The same Court in their decision in re: Sunderland 68 F. 2d, 318 after saying:

"In view of the familiar rule that applicant for patent is entitled to have any genuine doubt which may exist resolved in his favor."

stated further:

"We are of the opinion that he is entitled to have the rule as to doubt applied."

The same Court in their still more recent decision in re: George 68 F. 2d, 571 reversed the unfavorable decision of the Board and said:

"Applying the rule that doubt should be resolved in favor of the applicant, we conclude that all of said claims here on appeal should be allowed."

54 There is any amount of authority which can be cited to the effect that if doubt exists as to patentability or the Examiner has any doubt as to whether the claim would be held invalid, the claim should be allowed and the applicant given his day in Court.

The claims are submitted with the hope that the final rejection will be waived and that the claims can be considered allowable in view of the foregoing remarks, but in the event they are not considered allowable, request is made that they be admitted for the purpose of appeal.

The claims are presented having in mind the prior art of record, an English patent No. 7005 of 1913 which was referred to by the Examiner at an interview and a demonstration of the invention, and at which time the reference structures depended upon by the Examiner were also demonstrated. As then clearly shown applicant's device produces an intimate mixture of air and water which is discharged as a coherent stream, full of air bubbles. The reference constructions fail to do this.

Applicant's device mixes two fluids.

Reference construction atomizes one liquid.

In the reference construction, the apertures 10 are not for aspirating air and their function must not be essential since they are not even mentioned in the claims

and are not necessary for the atomizing function. This is a structural difference between applicant's and the reference's claims.

Applicant's device is in combination with the Venturi tube principle, while reference constructions are not, because the jets issuing from the nozzles 3 and passing through the screens 6 are too distant from each other. As a consequence, air enters the casing 1 through the
55 screen 6; the jets from nozzles 3 do not join each other. Moreover, the result claimed in the reference (viz:, the formation of spray or mist-like jet floating in the air) is not due to the plurality of nozzles 3.

In lines 5 to 10, page 3 of the reference, it is stated that the volume of the spray may be increased either by increasing the size of the nozzle 3 or by using as many small nozzles as may be necessary. The use of a plurality of nozzles is therefore merely to increase the volume of the spray and not to improve the atomization, (lines 5 to 6, page 3). In fact, the device must work even better with a single nozzle 3 since evidently when two or more nozzles are used, even as shown in the drawing of the reference, when they are substantially spaced from each other to avoid the Venturi effect, the diverging atomized jets issuing from the screen 6 intermix and tend to render the droplets bigger.

In applicant's case, the division of the water under pressure:

a) increases the surface of contact between air and water, which means a better aeration and more air-bubbles in the jet;

b) distributes the pressure of water and results in a substantially thick stream flowing softly;

c) helps the imprisonment of the air drawn in in the mass of liquid.

The statement in each of applicant's claims that air is drawn in and passes through the casing with the water discharged, differentiates structurally applicant's device from the reference constructions inasmuch as the applicant's device embodies the structural requirements of the Venturi principle, while the reference construction does not, since the latter not only does not produce the
56 Venturi effect but it is so constructed as to avoid it. Since this novel combination produces a highly im-

proved mixing of the air and water, allowance of the claims is believed proper.

As to the aforementioned English patent, the point was made at the interview that the paint distributor of that patent teaches the spraying of paint in a mist-like state. It would be inappropriate for such a paint distributing instrumentality to mix the spraying paint with air to form air bubbles such as are produced in applicant's invention, on account of the fact that the air bubbles would resist the even coating of the sprayed surface.

Now, after the teachings of this invention and a modification of the device of the English patent made in accordance with the teachings of the invention, the practice does not sanction and the decisions do not justify the conclusion that the English patent is a reference which can operate to limit the invention. All claims include a casing having an air-admitting means (not a scavenging opening such as is in the English patent) for if the openings are air-admitting means, they would resist scavenging function. The claims also recite that there is an entrainment of air and performance of this injector effect cannot be obtained without a relation of parts or elements constituting the invention.

The demonstration made in the presence of the Examiner showed that the entrained air with the water produced a "soft" stream which did not splash and which, when caused to flow in a container having soap, produced suds having minute bubbles which did not quickly lose their shape and that an effective suds was maintained intimately mixed with and on the surface of the water.

57 Now what of the prior art? Is there anything in it that produces the result of applicant's invention and is the device of the English patent pertinent to give the effect without changes made after the teachings of this invention? Certainly the English patent, which is nearest of the prior art in structure to applicant's invention, could not be operated to achieve applicant's result without using the openings 10 as air inlets rather than as exit openings. Demonstration before the Examiner has proved that the openings 10 could effectively be closed with a rubber band and not affect the functioning of the reference construction, thus conclusively proving that the openings 10 are not intended to allow the suction of the air which is the very purpose in the applicant's device. The Exam-

iner will recall that when the rubber band effectively closed the air entrance in the applicant's device, the device simply would not operate.

The jets 3 in the reference construction are so set as to deliver individual streams to and through the screens 6 and would have to be modified in view of applicant's invention to produce anything like the function of applicant's invention.

There are decisions which support applicant's contention that a device which was not intended to perform the function of the invention claimed and which did not contain a description of operation as functioned by an invention claimed is not a relevant or competent anticipation.

At page 760 of the Journal of the Patent Office Society of 1934, fourth paragraph, there is a statement as to the proper treatment of an invention and a reference as follows, viz:

58 "Things which cannot be combined in fact, without material alteration, should not be combined in law to anticipate a combination. And it must not be forgotten that knowledge after the fact should be excluded in constructing a mental anticipation."

It is believed sound reasoning to state that it is only "after the fact of this invention" that any conception of the use of the device of the English patent could be visualized as having inherent qualities to perform the function of the invention even after material alterations.

The claims are therefore submitted with the hope that the application will be dealt with in the light of the article by John H. Ruckman beginning at page 757 of the cited Journal.

Respectfully submitted,
E. Aghnides
By Frank S. Appleman
Frank S. Appleman, Atty.

FSA:LBL
Dec. 12, 1939

59

(Letterhead—Department of Commerce)

Please find below a communication from the EXAMINER in charge of this application.

Conway P. Coe
Commissioner of Patents.

Frank S. Appleman
1331 G Street N.W.
Washington, D. C.

Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

(Mailed Dec. 20 1939)

Responsive to amendment filed Dec. 12, 1939.

The proposed amendment of Dec. 12, 1939, is refused entry for the reason that it does not put the application in allowable condition after Final Rejection.

The number of claims filed is held unreasonable in view of simplicity of the subject matter and in view of the prior art. The nine claims depending upon claim 42 either recite elements necessary to make claim 42 complete or immaterial structural details such as that the "forminous parts are removable". The claims are, therefore, subject to rejection on the ground of multiplicity.

Claim 42 reads on the British patent 7,005 over which there is no difference in structure recited. Claim 43 calls for an upstream sieve which, if interpreted to cover the perforated plates disclosed, also is indistinguishable from the perforated plate 2 of the British patent. Claim 44 recites the downstream wire mesh screen which the British patent possesses. Claim 45 merely pluralizes its screens and claim 46 makes the screen removable, neither of which distinguishes. In claim 45 a part cannot consist of a plurality of spaced screens. Claim 47 includes the contracted downstream end not of itself sufficient to patentably distinguish. Claim 48 merely extends the casing beyond the screen. Claims 49 and 50 recite the plurality of air openings which the British patent shows. The
60 attachment feature claim 51 involves no more than ordinary skill and choice. Claims 52 and 53 do not recite any structure to distinguish from the British pat-

ent but rely wholly upon a statement of function. The structure whereby the alleged difference in operation is obtained must be recited by the claims. Lines 8-12 of claim 52 are vague and indefinite, and it is not clear that retardation by the downstream screen has anything to do with the matter. The last five lines of claim 53 contain a statement of a desired result but no teaching of how it can be obtained.

A proper response is required on or before Jan. 14, 1940.

PRN

Fish
Examiner.

61 (Application Div. U.S. Patent Office Jan 12 '40)

IN THE UNITED STATES PATENT OFFICE

(U. S. Patent Office Jan 13 1940 Division XXXII.)

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices.

Div. 32
Room 4086.

Hon. Commissioner of Patents,

Sir:

Cancel all of the claims and substitute therefor the following:

1 ~~54~~. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphgram at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for timely breaking up the water and for offering sufficient resistance for thoroughly mixing it with

air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

2 55. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the cham-
62 ber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

3 56. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

4 57. The device of claim 1 54 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom im-

mediately join each other to form a single jet.

63 5 58. The device of claim 1 54 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having aperatures which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

Remarks.

The object in this case is to secure a jet of water that is so full of minute bubbles of air in suspension that it has a whitish color and is soft to the touch. This is brought about by two distinct steps. First, the water in the chamber is thoroughly aerated so that it will have, insofar as possible, the maximum quantity of air. This end is accomplished by the high kinetic energy of the jet as it is injected into the chamber and the resistance that it meets from obstructions such as the screens at the outlet end. This results in finely breaking up the water and thoroughly mixing it with air. Second, having secured the aerated mixture it is then withdrawn from the chamber in the form of a coherent jet with small air bubbles disseminated throughout the jet. The preferred means for accomplishing this end is a screen at the discharge end of the chamber of sufficient resistance to the flow of the stream and in which the openings are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet. The reason that this latter happens is because the zone of aspiration of each little stream cuts or is at least tangent with the suction zone of the neighboring stream.

The Examiner relies principally upon the British patent No. 7005 of 1913 but this patent does not produce a coherent jet but instead it forms a spray. While there is some pictorial resemblance between the device of the British patent and applicant's device, it is quite apparent that their mode of operation must for some reason be entirely different, otherwise one would not produce a spray and the other produce a coherent jet. In order

64 to produce a spray no air is necessary. All that is required is a means for subdividing finely the stream of water outside of the device. It is stated in the British

patent, page 2, lines 25 to 27 that there is a nozzle employed "so as to cause a free and substantially unbroken jet of liquid to impinge upon a stationary foraminous screen of the nature of wire fabric". As this unbroken jet of liquid hits the screen in the British patent, due to the fact that there is insufficient resistance in the screen, the jet of water is merely subdivided and passes into the atmosphere in the form of a mist but without any entrainment of air in the stream of water. The reason why there is no entrainment of air is because the combined areas of the nozzles at the upstream end are relatively small, as compared with the area of the discharge outlet, and the relative resistance to such a fine high velocity stream is low.

In order to make the British patent function in the same way as in applicant's device, one of two things would have to be done. The resistance of the screen at the outlet end would have to be increased to such a point that it would entrain the air inside of the chamber. One way of accomplishing this increased resistance would be by using a plurality of screens superposed on each other. The other way would be by increasing the total orifice area at the upstream end and from whence it impinges on the screen. By so doing the water instead of merely passing through the screen without entrainment of the air, floods the face of the screen and entrains the air in it producing the jet effect. It is apparent that until air is mixed with the water by the screen and as it leaves the screen, there will be no induction of air through the air ports. Only so much air is drawn through the air ports as leaves at the discharge end of the device mixed with the water and in the British patent this is nil. Accordingly, if the proportions of the British patent are not such as to entrain the air through the screen, there will be no air induced through the aperatures 10. On the other hand, if a sufficient amount of air is entrained through the screen in the British patent, then it will not discharge in the form of a spray.

65 The other British patent upon which the Examiner relies, No. 6012, of 1909 represents the opposite extreme. Here the resistance of the plates *f* is so great that instead of entraining air in any quantity they have a tendency through the baffle effect of releasing any substantial quantity of air that may have become entrained in the liquid. The purpose of this invention is to dissolve

ozone in water. Ozone is only slightly soluble in water and to introduce enough ozone into the chamber so as to produce a mixture comparable to applicant's aerated water would simply mean a loss of the major quantity of the ozone introduced. The effect of the perforated plates is stated in the patent, to be so that the jet of fluid between each two plates is divided into several divisional currents striking against each other. In addition the plane portions of these plates form such a resistance to the passage of the water that a very little quantity of gas can be drawn through the device. The purpose of this invention being entirely different and the impossibility of producing a jet similar to that of applicant's embodies an entirely different conception and mode of operation.

Some objection was raised heretofore by the Examiner that the claims were functional in form. They are now believed to be free from that objection, by utilization of the "means" form of claims which the weight of authority now supports. Reference is made to the recent edition by Stringham on "Patent Claims". He says,—

Sec. 5230:

"Means" good. Claims in "Means" form have been sustained many times for every instance in which they have been condemned.

Sec. 5231:

"Supreme Court. Claims in "means" form have been sustained several times in the highest court.

Sec. 5233:

"Office allowance. "Means" claims are allowed by the Patent Office in numerous applications, daily.

Sec. 5236:

"Means" as structure. In various decisions it has been stated that "means" to perform a function must be regarded as a structural limitation.

66 Sec. 5237:

"Essence" good. Under numerous decisions the "essential" element of a claim may be expressed as "means" plus a functional statement.

Sec. 5262:

"Single or plural. The term "means" may be applied to one element or to more than one.

Referring now to claim 54 attention is first directed to the fact that the preamble of the claim is for a "device

for producing a coherent jet of water containing air bubbles", and the closing statement of the claim is "a coherent jet having small bubbles disseminated throughout the jet". These are limitations in the claims which cannot be disregarded in comparing them with the prior art. None of the references disclose a device which will produce a jet of this character. The reason why applicant's jet is produced is because the device is provided with a means in the path of the stream of water after it leaves the inlet orifice that finely breaks up the water and offers sufficient resistance for thoroughly mixing it with the air and unites the water into a coherent jet. This can be specifically accomplished by means of the screen 20 in Fig. 1, or it can be accomplished by means of the superposed screens 40 and 42 in Fig. 4, or it can be accomplished by the baffle 50 and screen 54 in Fig. 5, or it can be accomplished in Figs. 6 and 7 by means of the obstructions 60 and 66 respectively in association with the screen at the outlet. There being a number of different means as disclosed in the specification by which this product can be made so long as it finely breaks up the water, thoroughly mixes it with the air, and unites it into a coherent jet, it is submitted that applicant is entitled to a claim of this scope.

Claim 55 is along the same lines as claim 54 but specifies a means for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air, and other means for uniting the aerated water to form a coherent jet. This form of claim will read on Figs. 4, 5, 6, 7 and 8.

Claim 56 specifies that the resistance offered by
67 the screen is in proportion to the cross sectional area of the upstream orifice. In other words, with a screen of a definite resistance it is necessary to have an orifice of sufficient size to furnish the necessary volume of water in order that the resistance to flow may be created in the screen sufficient to entrain the air. On the other hand, with an orifice of definite size furnishing a constant volume of water, it is necessary to select a screen with a definite resistance in order that the resistance to flow may be created in the screen sufficient to entrain the air. It is this fundamental idea of finely breaking up the water and of having a certain resistance to the flow of the stream through the screen so that it will effect the mixing and uniting of the aerated water to form a coherent jet upon which applicant's invention is based.

Claims 57 and 58 which are based upon claim 54 particularize the means for accomplishing the desired end.

Since this application is under final rejection, and the time limit for appeal is January 14th, it is trusted that the Examiner will be able to give this matter early consideration. In the event that he is unable to see his way clear to allow the claims or to make any suggestions respecting further amendment thereof, then it is requested that the amendment be entered as putting the claims in better form for appeal.

Respectfully submitted,
Elie Aghnides
By John Boyle

Washington, D. C.
Jan. 12, 1940.

68 IN THE UNITED STATES PATENT OFFICE

17

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices

POWER OF ATTORNEY

Hon. Commissioner of Patents,
Sir:

I hereby appoint John Boyle, Jr., 801 Washintgon Loan & Trust Building, Washington, D. C., my attorney in the above entitled application with full powers to transact all business in the United States Patent Office connected therewith.

Elie Aghnides
Applicant

69 (Letterhead—Department of Commerce)

Paper No. 18
PRN:TIS

Please find below a communication from the Examiner in charge of this application.

Conway P. Coe
Commissioner of Patents
Applicant: Elie Aghnides
Ser. No. 182,884
Filed—Dec. 31, 1937
For Fluid Mixing Devices

John Boyle, Jr.,
801 Washington Loan & Trust Bldg.
Washington, D. C.

(Mailed Jan. 13, 1940

Added art:

Friedrich	2,003,184	May 28,1935	261/116

The proposed amendment of Jan. 12, 1940, does not make the application allowable and is, therefore, not entered. Of the proposed claims it is held that claims 54-56 cover structures shown by the references of record. These claims are capable of argument only in connection with the final result and do not clearly define apparatus distinct from the references. These claims attempt to cover generically a large number of devices, each of which operates upon a different principle. In view of what the references admittedly show the generic structure is unpatentable. Attention is also directed to the patent to Friedrich, made of record above, wherein a similar product is produced and in which the structures set forth in claims 54-56 are believed to be disclosed. Attention is directed to Figs. 17 and 20 particularly, showing elements for breaking up the particles and uniting the stream.

The claims may be entered for purposes of appeal provided applicant expressly waives Ex parte Mevey 1891 C. D. 115, in regard to Friedrich and British patent 7,005.

A complete and proper response is required on or before Jan. 14, 1940, to prevent abandonment.

Fish
Examiner

P.R.N.

70 IN THE UNITED STATES PATENT OFFICE

(United States Patent Office Stamps # 20
Jan. 13-40 133270 B 2Check—15.00)

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices

Div. 32
Room 4086

Appeal to the Board of Appeals

Honorable Commissioner of Patents,

Sir:

I hereby appeal from the decision of the Primary Examiner rejecting all the claims in my application. Applicant expressly waives ex parte Mevey 1891 C. D. 115, in regard to the Freidrich patent and the British patent 7,005.

The reasons of appeal are that the Examiner erred in rejecting the claims on the references and for the reasons of record.

The Appeal fee of $15 is enclosed and an oral hearing is requested.

Respectfully submitted,
Elie Aghnides,
By John Boyle, Jr.
Attorney

Washington, D. C.
Jan. 13, 1940,

Stamp—Board of Appeals—Jan 15 1940 U. S. Patent Office

71 EEG

Paper #19

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

January 18, 1940

John Boyle, Jr.,
801 Washington Loan & Trust Bldg.,
Washington, D. C.
Applicant—Elie Aghnides
Serial No.—182,884
Filed—Dec. 31, 1937
For—Fluid Mixing Devices
Div. 32

In this case your power of attorney has been accepted.

Respectfully,
Conway P. Coe
Commissioner

72 Letterhead—

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

January 18, 1940

In re application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices
(Div. 32)

Mr. Frank S. Appleman
1331 G Street, N.W.,
Washington, D. C.

Dear Sir:

On January 12, 1940, the applicant appointed John Boyle, Jr., as his attorney in the above entitled application; therefore, further communications from the Office will be addressed to said attorney, (ex parte Eggan, 172 O. G., 1091).

Very respectfully,
J. A. Brearley
Chief Clerk,
per F.

73 Div. 32 Room 4086 PRN:TIS Paper No. 21

UNITED STATES PATENT OFFICE
Washington, D. C.

(Mailed Jan 23 1940)

In re appliaction of
Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937

Before The
Board of
Appeals

For: FLUID MIXING DEVICES

EXAMINER'S STATEMENT

This is an appeal from the final rejection of claims on references also on estoppel in view of an election. Since the final rejection applicant filed the proposed amendment of Dec. 12, 1939, which was refused entry and the amendment of Jan. 12, 1940, which is entered for the purposes of this appeal. The claims presented after final rejection are of different scope from those formerly prosecuted, and upon consideration thereof and further search, it was

held that they were unpatentable over British patent 7,005, and the U. S. patent to Friedrich. Applicant has expressly waived the right to have the application remanded to the Primary Examiner under Ex parte Mevey 1891 C. D. 115. The appeal is, therefore, forwarded upon claims 54-58.

The claims are:

54. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphrgm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

74 55. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

56. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the in-

let end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

57. The device of claim 54 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

58. The device of claim 54 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

The references are:

Friedrich	2,003,184	May 28, 1935
Haisman (Br.)	7,005	Mar. 22, 1913

The alleged invention relates to a device attachable to a common water faucet to introduce air into the stream of water to thereby form a coherent stream of water
75 including finely divided air bubbles, softening the impact to prevent splashing. The disclosure contains seven forms differing in principle as well as in means for attachment to the faucet.

By an election made May 8, 1939, Paper No. 10, applicant restricted himself to a subgeneric claim 24 which covered the forms shown by Figs. 2, 5 and 6.

Fig. 2 shows a hollow body 24 threaded at its upper end provided with a flat seat to secure the perforated disk 26 against the end of the faucet 11, a seat for screen 28 and reduced outlet aperture. The plate 26 has a large number of apertures which when the faucet is opened discharge a spray into the chamber which spray induces a flow of air through channels 30. The screen 28 mixes the air and water while the restricted outlet reduces the size of the stream.

In Fig. 5 the body 44 clamps the plate 48 having a single central orifice, a second plate 50 with a central obstruction to cause spattering to the sides and a screen 54. Small apertures adjacent the plate 48 introduce air which seems to be induced by the spattered water and mixed therewith by the screen 54 to form a stream of water including air bubbles.

Fig. 6 is similar to Fig. 5 except that the disk 56 provides water orifices near the walls of the body to form a spray striking the shelf 60 and deflected toward the center.

The patent to Friedrich relates to a foam producing apparatus and method. As shown by Fig. 2, water under pressure is supplied by pipe 32 to an annular chamber from which it enters the tube 31 by projection 35, each having an orifice 37 whereby a jet of water is formed. The water jets induce flow of air which mixes with the water to form foam. The reduced outlet extending toward the left would form a coherent stream of the foam. The water is mixed with a foam forming solution whereby
76 the foam is stabilized. In Fig. 20 the patentee adds baffles 161 to "retard the foam and by increasing turbulence render the bubbles finer" as stated on page 5, column 1, line 33.

The British patent to Haisman et al discloses a spraying device including a chamber 1 having connection 4 to a source of pressure, a diaphragm 2 providing spray orifices 3, a screen 6 in the outlet and apertures 10 permitting the free entrance of air into the chamber between the jets 3 and the screen. While the patentee expresses the intention of using the apertures 10 to remove solid particles, the jets also inherently induce air so that the water will be mixed with air. While the final product is

stated to be a spray, it is evident that the structure is closely similar to that of applicant, Fig. 2, and if there is any difference in result it must be due to some variation in proportion between the parts.

Claim 54 recites a device for producing a coherent jet of water containing air bubbles comprising a chamber 24 having inlet and outlet openings, a diaphragm 26 at the upstream end having at least one orifice, an air port 30 through which air is induced by the stream of water and means in the path of water for breaking up the water for offering sufficient resistance for mixing it with air and uniting the aerated water to form a coherent jet with small bubbles disseminated throughout the jet. The last named means is intended to cover generically the screen 28 and restricted outlet, the deflecting plate 50 and screen 54 of Fig. 5 as well as the shelf 60 and screen 62 of Fig. 6. These two devices function upon different principles.

Claim 7 is rejected as reciting structure fully met by Haisman et al. The reference includes the chamber 1, diaphragm 2, having orifice 3, air port 10 and means 6 in the path of the stream of water for breaking up the water. It may form a spray instead of a coherent jet having small bubbles but the claim recites no definite structural proportions not already shown by the reference. The claim attempts to cover generically such diverse devices as screens, Fig. 2, and baffles, Figs. 5 and 6, by differing from the reference solely by stating the final product. If the elements shown by the reference can be rearranged and proportioned in such a way as to produce the result as is apparent from comparing Fig. 2 with the patent drawing, it is evident that the claim should fully set forth such differences in terms of structure and not in result alone.

77

Claim 54 is also rejected on Friedrich wherein the series of liquid apertures 37 is equivalent to the perforated diaphragm 26, the central air intake is "the airport opening into the chamber" and the baffles 161, Fig 20, and restricted outlet are the means for mixing the air and water and forming a coherent jet having bubbles of air. The resulting product is believed to be a coherent jet in the sense used by applicant and may differ by mixing a larger proportion of air.

Claim 55 differs from claim 54 only by splitting the last "means" into two separate "means" which "means" are argued to be opposite sides of the screen 28. If so,

these means are structurally present in the British patent showing a like screen. Friedrich shows screens 161 for breaking up the water and mixing it with air as well as a constricting outlet for uniting the fluid to form a single jet.

Claim 56 is similar to claim 54 in that a single means performs the essential step in the operation. The claim states that the resistance of the "means" 28 and area
78 of the liquid orifice 26 are so proportioned as to give the result but does not state what that proportion is. In fact there is no definite teaching of any quantitative factors in this application. If a perforated plate such as shown by Fig. 5 is used the means at the outlet must be more elaborate while if the plate 26 is used the plurality of jets may merge, induce and mix with air and the screen 28 suffice to form the desired jet. For that reason the functional statement does not teach how the British patent would have to be modified to obtain the result. The claim is also believed to be met in the Friedrich patent.

Claim 57 limits the last named "means" to a screen 28 the openings of which are "sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet". Claim 54 recited only a single orifice which would produce but one stream; the screen could not, therefore, unite the streams. Fig. 5 shows a single orifice but the streams are created by a baffle plate 50 not included by this claim. Other than this inaccuracy the screen may be considered as fully met in the British patent while the baffles 161 of Friedrich would be the equivalent.

Claim 58 also depends upon claim 54 and differs from claim 57 only by including "superposed screens" in the outlet. Such screens are shown by Figs. 4 and 8 which species are excluded by the election of species, Paper No. 10. This claim is, therefore, rejected on the ground that applicant is estopped to prosecute such a claim in this application. Also the two screens differ from the mixing elements of the British patent and Friedrich only by duplicating the screen of the former and substitution
79 of equivalent in the latter.

The claims are considered to be properly rejected.

Respectfully submitted,
Karl R. Fish
Examiner, Division 32.

80

(Letterhead—Department of Commerce)

(Paper No. 22)

February 8, 1940

Sir:

The case of Elie Aghnides

Serial No. 182,884, will be heard by the Board of Appeals on the Third day of June, 1940.

The hearings will commence at 9:30 A. M. and as soon as the argument in one case is concluded the succeeding case will be taken up.

If any party, or his attorney, shall not appear when the case is called, his right to an oral hearing will be regarded as waived.

The time allowed for arguments is as follows:

Ex parte cases, thirty minutes;

Inter partes appeals: Interlocutory and final hearings when no testimony has been taken, thirty minutes each side; final hearing when testimony has been taken, one hour each side.

By special leave, obtained before the argument is commenced, the time may be extended.

The appellant shall have the right to open and conclude in inter partes cases, and in such cases a full and fair opening must be made.

Briefs in inter partes appeals must be filed in accordance with the provisions of Rules 144 and 163, as amended.

Respectfully,

Conway P. Coe

Commissioner of Patents

To Mr. John Boyle, Jr.,
801 Wash. Loan & Trust Bldg.,
Washington, D. C.

81

IN THE UNITED STATES PATENT OFFICE

23

In re application of
Elie Aghnides,
Serial No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

Before the
Board of Appeals.

BRIEF

This invention relates to a device that is ordinarily applied to a water faucet for the purpose of making a jet

of water containing air bubbles uniformly disseminated throughout the jet. Such a jet is whitish in appearance, soft and light to the touch and possesses numerous advantages not found in the ordinary hard water jet as discharged from a faucet. For instance, when a full glass of water is drawn through the device, myriads of bubbles escape leaving only half of the glass full, thus proving the large amount of air that was intimately mixed with the water. If one's hand is put in the path of the bubbly jet, the jet will flow evenly and uniformly over the surface and will wet the entire surface without splashing. The softness and lightness of the jet is due to the presence of the air bubbles uniformly disseminated throughout the jet which lessens the density of the jet. If such an aerated jet is permitted to flow into a soap solution it will make a large amount of creamy lather. This result is produced by finely breaking up the water and mixing it with air before discharge to imprison in the mass of the liquid small air particles.

Various structural modifications are shown in the drawing for making the jet in this manner. In all of them there is an up-stream apertured diaphragm, an aerating chamber provided with air inlets and a down-stream screen near the discharge and which finely breaks up the water and offers sufficient resistance for thoroughly mixing the water with air.

82 In Figure 1 there is an up-stream diaphragm 16 that is provided with a plurality of apertures and a single down-stream screen. In Fig. 2 substantially the same arrangement is shown except that there are fewer apertures in the up-stream diaphragm. In Fig. 4 there is an up-stream diaphragm 36 with a plurality of apertures and two spaced down-stream screens 40 and 42. In Fig. 5 there is a single apertured up-stream diaphragm 48, a down-stream screen 54 and an interposed baffle plate 50 to assist in breaking up the water. In Fig. 6 there is an up-stream diaphragm 56 with a limited number of apertures, a down-stream screen 62 and an interposed baffle 60 to assist in breaking up the water. In Fig. 7 there is a single up-stream diaphragm 64 with a single aperture, a down-stream screen and interposed baffles 68. In Fig. 8 there are two separate inlets for different kinds of liquids with an up-stream diaphragm for each compart-

ment having a plurality of apertures and spaced down-stream screens. All of these modifications produce the same kind of a coherent white jet and make it in the same manner, that is, by finely breaking up the water and offering sufficient resistance for thoroughly mixing it with air. The essential features of the invention, as embodied in the various modified forms, shown in the drawing, comprise an up-stream apertured diaphragm, adapted to deliver a stream of water with substantial velocity and a down-stream screen in the path of the stream of water which finely breaks up the stream and mixes it with air before discharge. The screen offers only a small resistance to the flow of the stream therethrough, that is, the required minimum resistance necessary for the proper functioning of the device. In order to accomplish the desired ends there is a sufficient volume of water of such a velocity issuing from the up-stream diaphragm to spread over and flood the down-stream screens. The resistance offered by the down-stream screen or screens is sufficient to break the velocity of the stream of water, flood the screen and oblige the fluid to divide and mix.

83 When the water is turned on, if the faucet is opened only slightly so that very little kinetic energy is developed in the water as it emerges from the apertured up-stream diaphragm, the water will discharge from the down-stream screen across in a perfectly normal manner and without air bubbles. As the faucet is opened wider and the velocity of the water increases, the water emerging from the apertured up-stream diaphragm, will draw air in through the air ports and this water striking the discharge screens will be finely broken up, mixed with air and flood the screen. When the water attains a certain velocity, the entrained air acquires the necessary speed to pass through the resistance offered by the screen and the water. The air is likewise divided by the stream and the two fluids thus broken up thoroughly mix and the air particles are imprisoned in a mass of liquid. Having secured the aerated mixture it is withdrawn from the chamber in the form of a coherent jet with small bubbles desseminated throughout the jet. This arises in part from the fact that the openings in the down-stream screen are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to

form a single jet. This result can also be attained by utilizing a constricted discharge opening in association with a screen having apertures not sufficiently close together to cause the stream to unite.

THE PRIOR ART

The Examiner relies upon two references, the U. S. Patent to Friedrich and the British patent to Haisman, and takes the position that all the claims are met by either one of these references. It is admitted by the Examiner and could not otherwise be denied that neither of these patents disclose an apparatus that will make a coherent jet of water having small air bubbles disseminated throughout the jet.

84 The title of the Friedrich patent is "Method and Means for Producing Foam for Fire Extinction". There could be no confusion between a coherent jet of water having air bubbles disseminated throughout the jet and what is known as foam. In order to make the foam of Friedrich certain foam forming chemical agents must be added to the water.

The British patent is entitled a "Spraying Device". The device can be used, as stated in the patent, to produce a fine spray suitable for moistening mine workings and it is stated that the spray resembles fine rain. It can also be used for spraying paint. As will be pointed out later a spray which has a tendency to spread itself out fan-shape is entirely different from a coherent jet of water having small bubbles disseminated throughout the jet. It is quite apparent that in the spraying of paint any bubbles in the spray do not only have no purpose but would be objectionable, because it would produce an uneven coating. We will now discuss more in full these two patents.

THE FRIEDRICH PATENT.

The Examiner seems to rely particularly on the disclosure in Fig. 2 of Friedrich. This is described in the patent, page 3, column 1, lines 65 to 72 as follows:

> "In the tube shown in Figure 2 the water supplied under pressure through the hose and the connection 32 enters the annular conduit 33 and from thence is

projected through the apertures 37 and 38 in spreading jets inclined with respect to the axis of the tube into the interior thereof, where under the action of the turbulence of the jets upon the air drawn in, foam is formed."

This however is to be read in connection with the following lines, page 2, column 1, lines 8 to 13; as follows:

"It is only essential that the jets should meet one another at a small angle at a point preferably in the actual direction of the tube so that at the meeting point the jets break up, whereby with a foam former present, foam is generated."

85 It is quite apparent from such disclosures that in the absence of a foam forming agent the main purpose of the invention is lost. It is true, as stated, in page 2, second column, lines 51 to 52 that by cutting off the supplies of foam former, water can be projected instead of foam. Nothing is said however as to how much air is included in the water and if it is present, what condition the air is in the jet. It is also stated page 2, column 1 that either foam or water can be directed on a fire at will. The purpose of the foam is to act as a blanket to cut off the air supply. To add air to the water stream in the absence of foam and directing it on a fire would only be adding oxygen to facilitate combustion and thus would counteract the effect of water. There is no disclosure in the patent at any point that indicates that the patentee produces a jet having the characteristics of applicant's jet. And if he did produce such a similar jet he would have to produce it in a way different from that disclosed and claimed by applicant. The way in which Friedrich operates is by having the jets of water under pressure meet at a point in a long tube where considerable turbulence is set up. To operate efficiently this tube, as shown in the drawings, is probably more than two feet long as can be judged by the proportions of the portable type as shown in Fig. 8.

The Examiner also relies on the disclosure in Fig. 20 of Friedrich, taking the position that it is the equivalent of the down-stream screens of the applicant. The nozzle shown in Fig. 20 is used in connection with the disclosure in Fig. 19 in which foam is discharged in a closed chamber, for example an oil tank. The Examiner

takes the position that these baffles 161 will mix the air and water and form a coherent jet having bubbles of air. It is said in the patent page 5 column 1, lines 33 to 35, that these guide surfaces 161 retard the foam and by increasing the turbulence render the bubbles finer. Nothing is said in the patent as to what the effects of these surfaces 161 would be if there was no foam forming agent present. It is our position that instead of rendering the bubbles finer that they would act as baffles to eliminate the bubbles from the jet if any bubble was in the water jet.

86 The nozzle 160 of Fig. 20 is shown only in association in the construction of Fig. 19 and whether it has any other utility or not, is not disclosed in the patent. Not only that, but these nozzles do not contract the jet to form a coherent stream of water, but they permit the jet to expand due to the flaring construction. The same thing is true of the sprinkler head, shown in Fig. 17; both of these nozzles may guide the liquid but they do not divide it as does the screen of applicant; see "inclined guide vanes 99", page 4, second column, line 38, and "guide surfaces 161", page 5, column 1, line 38.

In the absence of the foam forming agent it is believed that it can be safely stated that when the water discharges from the foam generating tube 31, Fig. 2, that there is no more air occluded in the water jet than is accomplished by an ordinary injector operating on the Venturi principle. That means, that whatever air bubbles are in the water jet at the discharge they escape immediately. As specified in all the claims there is no means in the path of the stream of water after it leaves the up-stream orifice and before it discharges at the outlet ends for finely breaking up the water and mixing it with air.

THE BRITISH PATENT

While there is some pictorial resemblance between the device of the British patent and applicant's device, it is quite apparent that their mode of operation must for some reason be entirely different, otherwise one would not produce a spray and the other produce a coherent jet. In order to produce a spray no air is necessary. All

that is required is a means for subdividing finely the stream of water outside of the device. It is stated in the British patent, page 2, lines 25 to 27 that there is a nozzle employed "so as to cause a free and substantially unbroken jet of liquid to impinge upon a stationary foraminous screen of the nature of wire fabric." As this unbroken jet of liquid hits the screen in the British patent, due to the fact that there is insufficient re-
87 sistance in the screen, the jet of water is merely subdivided and passes into the atmosphere in the form of a mist but without any mixing of air in the stream of water. The reason why there is no mixing of air is because the combined areas of the nozzles at the upstream end are relatively small as compared with the area of the discharge outlet, and the relative resistance to such a fine high velocity stream is low.

In order to make the British patent function in the same way as in applicant's device, one of two things would have to be done. The resistance of the screen at the outlet end would have to be increased to such a point that it would entrain the air inside of the chamber and mix it with the water. One way of accomplishing this increased resistance would be by using a plurality of screens superposed on each other. The other way would be by increasing the total orifice area at the upstream end and from whence it impinges on the screen. By so doing the water instead of merely passing through the screen floods the face of the screen and entrains the air in it producing the jet effect. It is apparent that until air is mixed with the water by the screen and as it leaves the screen, there will be no substantial induction of air through the air ports. Only so much air is drawn through the air ports as leaves at the discharge end of the device mixed with the water and in the British patent the mixing is nil. The openings 10 might serve to maintain the atmospheric pressure as the gradual rarefaction might break the jets which, according to the requirements of the British patent must be substantially unbroken, contrary to applicant's device which is arranged to break the jets and to mix them with the water before the discharge. The British patent does not claim that there is any air induced through the openings 10 and the purpose stated is to scavenge, but should the openings 10 improve the spray it is for the reasons just stated.

88 THE NOVELTY IN APPLICANT'S CLAIMS.

All the claims are limited to a device for producing a coherent jet of water having small bubbles disseminated throughout the jet. This is a distinctive limitation in the claims and since neither one of the patents produce such a jet it is submitted that that alone would be enough to warrant the allowance of the claims. The claims do not cover all means for making such a jet but only such means as are in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end and this means must have the capacity of finely breaking up the water and offering sufficient resistance for thoroughly mixing it with air, and thereafter uniting the aerated water to form a coherent jet. The Examiner rejects on the ground that this is not a structural limitation. We refer to a long list of authorities on Page 5 of the amendment of Jan. 12, 1940. In a recent case decided by the Board ex parte Long 45 U.S.P.Q. Examiner in Chief Shaffer held:

> "Claims for means coupled with statements of function are allowable where there is no ambiguity. It has long been the practice of the Patent Office to permit use of means coupled with statements of function as a convenient way in which to concisely express subject matter"

In view of the various ways in which this result can be accomplished and the result being novel it is difficult to see what other satisfactory way can be had for adequately claiming the invention. There is certainly no ambiguity in this phraseology.

Claim 55 contains the additional limitation of a separate means for uniting the aerated water. Claim 56 contains in addition to the limitations of claim 54 the relationship between the resistance of the screen and the velocity of the entering water as measured by the cross sectional area of the orifice so as to flood the screen.

Claim 57 specifies the presence of a screen at the discharge end of the chamber, the openings in which are sufficiently close together to cause the streams of aerated water to join together to form a single jet.

89 Claim 58 contains in addition to the limitations of claim 54 superposed screens and nowhere shown in any of the references.

The absence of any reference that shows the production of a jet of this character and even if they did, the absence of the means set forth in these claims for accomplishing the result, and the concise and clear limitations on the means for accomplishing the result are any one of them believed to be sufficient to warrant the allowance of the claims.

THE EXAMINER'S STATEMENT

Page 3, line 2, the Examiner states that "the disclosure contains seven forms differing in principle", but he does not state in what respect they differ in principle. This application has had a long prosecution and this is the first time that this objection has been raised. We submit that all of the forms are similar in principle in securing the specified jet of water.

In the next paragraph on page 3 the Examiner says that applicant restricted himself to a sub-generic claim 24 which covered the forms as shown by Figs. 2, 5 and 6. It is desired to point out however that as applicant's attorney reads claim 24 it covers not only the forms shown in Figs. 2, 5 and 6 but also the forms as shown in Figs. 4 and 7. The Examiner has not pointed out the limitations that so restrict this claim and it is not believed that he can. We rather assume that he is seeking to put a very limited interpretation on a casing having its upper end enlarged to form an internal shoulder; but this construction is surely disclosed in Figs. 4 and 7. In any event we are not so sure that applicant did so elect to limit his invention.

But whether that be true or not applicant is entitled to prosecute in this application generic claims and any three elected species and since he has only elected one, if the Examiner is correct, this permits the addition of two more species claims.

90 At the bottom of page 3 the Examiner explains his position with reference to the Friedrich's patent, but there are statements here that cannot be found in the patent specification and cannot otherwise be justified. The Examiner states "the water jets induce flow of air which mixes with the water to form foam". There is no such mode of operation disclosed in Friedrich unless the foam forming agent is added to the water, before the air is mixed with it. He further states that the reduced out-

lets would form a coherent stream of foam, but the limitations in the claims call for a coherent jet of water and no one would ever designate a stream of foam as a stream of water. The Examiner further states that, "the water is mixed with a foam forming solution whereby the foam is stabilized", but there is no such statement in the patent to that effect. The foam forming solution is primarily added to form foam and by reference to page 2 of the Friedrich patent, column 1, line 75 the foam forming feature is the important aspect of the operation and not as suggested by the Examiner, the stabilization of the foam. The Examiner goes on to state that the baffles 161 retard the foam by increasing turbulence and render the bubbles finer, but he is careful not to state that the same thing would occur to a jet of water.

On page 4 the Examiner discusses the British patent and takes the position that the jets will induce air so that the water will be mixed with the air. He then goes on to state that the final product is a spray, but since a spray is only sub-divided water and the Examiner admits the final product is a spray it is difficult to see just where the air would be in the spray. We agree with the Examiner that the difference in result is due to some variation in proportion between the parts and that variation has been heretofore discussed in applicant's analysis of the British patent.

The Examiner, four lines from the bottom of page 4, says that the devices of Figs. 5 and 6 function upon different principles but he does not state what the difference is. We submit that the deflecting plate 50 of Fig. 5 and the shelf 60 of Fig. 6 both function in the same
91 way to assist in breaking up the water into fine particles.

The Examiner on page 5 attempts to apply the British patent to claim 54. He admits that it forms a spray instead of a coherent jet but says that no definite structural proportions, not shown by the references, are set forth in the claims. We have already covered this so fully that it needs no repetition here. The fact of the matter seems to be that any type "of means claims" in the opinion of the Examiner is a claim for a result and not for a structure.

We are unable to find how the Examiner on the basis of the disclosure of the Freidrich patent can say that

the baffles 161 are means for mixing the air and water in the sense of breaking up the fluid to form bubbles in the water. To say that the resulting product of Friedrich is a coherent jet in the sense used by applicant but differing from applicant's by mixing a large proportion of air is doing a good deal of violence to the Friedrich disclosure.

The Examiner says that the resulting product of Friedrich is a coherent jet in the sense used by applicant but may differ by mixing a larger proportion of air. In the absence of a foam forming agent, the air entrained through Friedrich's nozzle will separate from the water at the discharge end of said nozzle, for the reason that said air is not imprisoned in the mass of the water in the form of small air bubbles. This is not the case with applicant's jet and no foam forming agent is necessary. A coherent jet of liquid containing bubbles of water as in applicant's case is not the same in properties or uses as a stream of foam as disclosed by Friedrich.

As to claim 55 the Examiner says that the British patent shows a like screen that has the same mode of operation as applicant's but in view of the fact that the British patent produces a divergent spray and applicant a coherent jet, it is hard to see how the Examiner can reach any such conclusion.

92 The Examiner says that Friedrich shows screens 161 for breaking up the water and mixing it with air as well as a constricting outlet for uniting the fluid to form a single jet. This is a highly inaccurate statement. The guide surfaces 161 are by no imagination screens; nor do they break up the water and mix it with air but instead they zig-zag the stream and are in the nature of an elongation of the tube. Not only is the outlet not constricting but on the other hand it is an expanding outlet, as can be clearly seen in Fig. 19.

As to the claim 56, the Examiner says that there is no quantative factors that teach proportions in this application. We might rest on the proposition that this is only a statement of the inherent functioning of the device but the disclosure on page 5, lines 1-14 makes clear that there is a very distinct quantitative relation between the velocity of the stream and the resistance offered by the down stream screen and since the aperature area of the up-

stream screen is a function of the velocity of the entering water, it is submitted that there is sufficient teaching to any one skilled in the art seeking to accomplish the desired end.

As to claim 57 the position of the Examiner is confused and unintelligible. It is predicated on the assumption that claim 54 only refers to a single orifice in the upstream screen but that is in error. Claim 54 states that the upstream screen has at least one orifice but obviously by that statement it can have more. Even if there was only one orifice, still the screen could unite the stream issuing therefrom when the openings are close enough to each other. There is no necessity of an interposed baffle when using a single aperture in the upstream screen, although the baffle might assist the breaking of the water, but it is not essential as will be apparent from an inspection of the various forms.

To say that the screen of applicant's device finds its equivalent in the British patent or Friedrich is to ignore the fundamental characteristics of a mechanical equivalent, which necessitates similarity in function.

93 As to claim 58, it has already been pointed out that there was no election that limited the species to Figs. 2, 5 and 6. If superposed screens were put in the British patent then instead of forming a spray it would then form applicant's jet. Certainly one screen or superposed screens are not the equivalent of the dividing means proposed by Friedrich.

Considering the statement of the examiner as a whole we cannot help but feel that every doubt, instead of being resolved in favor of the applicant has been resolved against him. Both of the patents that are now relied upon were never cited in this application until after it had been finally rejected. The patent of Friedrich now so strongly relied upon was never cited until Jan. 13, 1940 and the time that was left for an appeal was only one day. This is really the first time we have had an opportunity to present our version of the Friedrich patent, and the conclusion of the Examiner thereon was not a deliberate one arrived after a full discussion from both sides. The Board of Appeals therefore is in a position of being the first ones to review the position of the

applicant with respect to the pertinency of the Freidrich patent.

Respectfully submitted,
Elie Aghnides
By John Boyle, Jr.
Attorney.

June 3, 1940.

94 In the United States Patent Office

Paper # 24

(Board of Appeals U. S. Patent Office June 7, 1940)

In re application of
Elie Aghnides,
Serial No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

Before the
Board of Appeals

Supplemental Memorandum

The following demonstrations made by the inventor before the Board of Appeals at the hearing on June 3, 1940 were for the purpose of establishing facts, as listed below.

Applicant's Device

1. The jet is coherent and contains air-bubbles imprisoned in the flowing jet of water.
2. The jet is soft and light to the touch owing to myriads of air bubbles that one can see escaping.
3. The flow of the bubbly jet in a receptacle on liquid soap transformed the latter to an abundant creamy lather with bubbles all very small and of the same size.
4. The bowl which served for the soap experiment, turned upside down and put under the jet, was covered with bubbles and the flow was splashless.
5. The soap experiment repeated with the air ports closed gave practically no lather.
6. The bubbly jet, white in appearance when the air ports are open becomes transparent and free from air bubbles when the air ports are closed.

The Spraying Device of the British patent to Haisman.

1. With the "apertures 10" open, the jet is a diverging stream of rain like droplets, with total absence of air

bubbles in the stream.

95 2. With the "aperatures 10" closed, the appearance of the diverging rain like stream was the same as when the aperatures are open, showing that no air is induced through the aperatures.

3. To the touch, the rain like stream of droplets is quite different from applicant's jet.

4. The spraying jet is a splashing one.

The Foam Former of the Freidrich patent.

1. The jet is coherent in the same way as the ordinary water discharged from the faucet.

2. The jet is hard to the touch and splashing because whatever air is entrained through the device is not in the form of small bubbles imprisoned in the mass of the water jet and the air separates immediately from the water at the discharge end of the device and does not remain in the jet.

3. The flow of the jet on liquid soap produced some lather, formed by big bubbles of varying size. This lather was due to the agitation caused by the flow of the jet into the bowl containing the liquid soap and not from imprisoned air in the jet.

4. The soap experiment repeated with the air ports closed gave the same amount and kind of lather as with the air ports open, proving that the lather produced when the air ports were open was not due to the air entrained through the device. Further evidence was given in this respect by the soap experiment without any device but the water flowing from the faucet directly into the bowl containing the liquid soap, the same kind of lather being produced as with the Friedrich device.

5. The jet is grayish when the device is functioning normally, like the ordinary tap water flowing with high velocity, and remained the same when the device was operated with the air ports closed.

96 Comparison of Haisman's Device and Applicant's.

Haisman's spraying device was transformed to applicant's mixing device by putting at the outlet, a screen offering greater resistance to cause mixing of the air and water. The aperture 10 of Haisman then became for the first time, air induction inlets. The same result is possible by leaving the screen unchanged but increasing the cross sectional area of the upstream apertures

whereby the water emerges to impinge on the wire mesh screen with less velocity and which is equivalent to an increase of the resistance offered by the screen.

The demonstration proved that applicant's device can operate with one or more screens. All that one has to do to make a device according to the invention is to admit into the aerating chamber a jet of water with substantial velocity and to put in the path of the jet, one or more of the specified screens to obtain the bubbly jet.

Respectfully submitted,
John Boyle, Jr.,
Attorney.

June 7, 1940.

97

25

Appeal No. 33,918

VFM

Hearing: June 3, 1940

(Stamp—U. S. Patent Office—Board of Appeals—June 18 1940)

IN THE UNITED STATES PATENT OFFICE

Before the Board of Appeals

Ex Parte Elie Aghnides

Application for Patent filed December 31, 1937, Serial No. 182,884. Fluid Mixing Devices.

Mr. Frank S. Appleman and Mr. John Boyle, Jr. for applicant.

This is an appeal from the final rejection of claims 54 to 58.

Claim 54 is illustrative.

54. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the

chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

The references relied upon by the examiner are as follows:

Haisman et al (Brit.)
Friedrich 2,003,184 May 28, 1935

98 The invention relates to a device attachable to a water faucet which will introduce air into the water passing through it and form a coherent jet of aerated water issuing from it. The coherent water jet contains finely divided air bubbles. The device includes a chamber, a diaphragm at the inlet end of the chamber having at least one orifice in it for the passage of water to the chamber. The chamber is also provided with air inlets in its wall adjacent to and below the diaphragm. Water passing through the diaphragm sucks in air through the openings. The chamber is provided near the lower end with a screen which breaks up the stream of water and offers sufficient resistance for thoroughly mixing the water with the air drawn into the chamber. The extension of the chamber below the screen is restricted in cross section and serves to unite the aerated water into a coherent jet. This jet contains the air bubbles disseminated through it and remains coherent as it issues and does not tend to spread or splash.

The examiner depends on the disclosures of either one of two references in rejecting the claims. The Friedrich patent relates to a fire extinguishing device for producing foam. Referring to Figs. 19 and 20 of the patent, these figures disclose a long tube open at the inlet end to permit air to be sucked into the tube. Water containing a foam producing agent is admitted through openings in the side wall of the tube near the inlet end and the water sucks air into the tube. The outlet end of the tube is provided with a distributing sprinkler head which is fan-shaped and discharges a relatively wide and fairly thin stream. Within the head are arranged a series of

staggered baffles which retard the foam and by increasing the turbulence render the bubbles finer. This patent does not appear to show a construction that anticipates the claims before us. There is no thought expressed in the patent of forming a coherent jet of water with which the air bubbles are admixed and it would not be possible to obtain such a jet with the patented construction. The patentee desires mainly to mix air with a liquid containing a foam producing agent so as to produce foam and foam and water issues in a broad fan shaped stream from the distributor head.

The British patent discloses a spraying or atomizing device. It comprises an elongated cylindrical nozzle, a strainer near the liquid inlet and, a diaphragm spaced a short distance from the strainer and provided with small tubes through which the liquid passes. Adjacent to the outlet and there is arranged a screen which may be of any desired mesh. Approximately half way between the diaphragm and the screen the cylindrical wall of the nozzle is provided with three large openings. The patentee states that these openings provide an outlet for solid matter and induce a more perfect spray and minimize dripping. The device is intended for use in spraying paint or for atomizing liquids. There is no particular reference made to the entrainment of air and mixing it with the liquid or for forming a coherent jet of liquid with air bubbles in it. The distance of the large openings 10 from the diaphragms is so great that it is somewhat doubtful that any material amount of air will be entrained. If there is any mixing of the air with the liquid it appears to be a rather small amount. There is no constricting of the nozzle at the outlet so as to form a co-
100 herent jet. The patentee desires to obtain a spraying device and the liquid will spread out as it leaves the nozzle. It is clear that this patent contains no disclosure of the construction covered by the appealed claims.

It is also not evident how the two patents could be combined to meet the claims. We therefore believe the claims are patentable.

The decision of the examiner is reversed.

/s/ Eugene Landers
Examiner-in-Chief

/s/ P. Edinburg
Examiner-in-Chief
/s/ C. S. Shaffer
Examiner-in-Chief

June 18, 1940
Mr. John Boyle, Jr.,
801 Washington Loan & Trust Bldg.,
Washington, D. C.

101

Serial No. 182,884

(Letterhead—Department of Commerce)

(Margin Notations: In remitting the final fee give the serial number at the head of this notice: Uncertified Checks will not be accepted.)

Mailed Jun 25 1940

Elie Aghnides

Your APPLICATION for a patent for an IMPROVEMENT in FLUID MIXING DEVICE filed Dec. 31, 1937 has been examined and ALLOWED with 5 claims.

The final fee, THRTY DOLLARS, WITH $1 ADDITIONAL FOR EACH CLAIM ALLOWED IN EXCESS OF 20, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld; SEE REVISED STATUTES, SECTION 4885 AS AMENDED BY ACT OF CONGRESS APPROVED AUGUST 9, 1939.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about four weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF THE INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE

OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If it is desired to have the patent issue to an ASSIGNEE OR ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of the final fee.

After issue of the patent, uncertified copies of the drawings and specifications may be purchased at the price of TEN CENTS EACH. The money should accompany the order. Postage stamps will not be received.

The final fee will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

NOTICE.—WHEN THE NUMBER OF CLAIMS ALLOWED IS IN EXCESS OF 20, NO SUM LESS THAN $30 PLUS $1 ADDITIONAL FOR EACH CLAIM IN EXCESS OF TWENTY CAN BE ACCEPTED AS THE FINAL FEE.

Respectfully,
Conway P. Coe
Commissioner of Patents.

THIS APPLICATION
CANNOT BE RENEWED.
John Boyle, Jr.
801 Washington, Loan & Trust Bldg.
Washington, D. C.

102 (Stamps U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE
26 Amdt H

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937 Div. 32
Fluid Mixing Devices Room 4086

AMENDMENT UNDER RULE 78.

Hon. Commissioner of Patents,
Sir:

In the petition, line 2, cancel "Brussels, Belgium" and insert—New York, New York—, line 2, cancel the post-office address and substitute—609 West 158th Street, New York, N. Y.—; line 2, cancel "Greek Republic" and substitute—Kingdom of Greece—.

In the specification preamble, line 2, cancel "Greek Republic" and substitute—Kingdom of Greece—; line 2, cancel "Brussels, Belgium" and substitute—New York, New York—.

Page 2, line 9, cancel "an aperture" and substitute—one or more apertures—.

Page 2, line 16, cancel beginning "water" to the end of the sentence, line 19, and substitute—stream of water after it leaves the aperture or apertures and before it discharges at the outlet and for finely breaking up the water and offering sufficient resistance for thoroughly mixing it with air—.

Page 2, line 22, before "chamber" insert—cross section of the—.

Page 2, line 24, after "aperture" insert—or apertures—.

In the amendment to page 3, dated June 18, 1038, cancel the paragraphs comprising the last twelve lines on page 1 of said amendment and the first eight lines on page 2 of the said amendment and substitute therefor the following:

103 —The essential feature of my invention is an arrangement of a dividing means in the path of the liquid emerging from the aperture or apertures delivering liquid to the aforesaid chamber, this dividing means being adapted to finely break up the fluids and to imprison in the liquid, air particles forming therein such small bubbles that they remain in suspension in the jet.

In the devices suggested until now, the air drawn in by the liquid separates immediately at the outlet of the apparatus and no known apparatus has for its object, as is the case with my invention, the formation of a coherent "white" jet, this being due to the fine division of the air and to the formation of a true suspension of a multitude of air bubbles in the water.—

Page 3, line 21, cancel "the aperture through which", line 22, cancel "is subdivided into" and substitute—through—; line 23, cancel the rest of the sentence after "apertures".

Page 4, line 2, before "screens" insert—superposed—.

Page 4, cancel the inserted amendment of June 18, 1938 for lines 3 to 6 of the original specification and found on page 2 of the said amendment, lines 14 to 18.

Cancel the amendment to page 4 after line 9, dated Feb. 17, 1938, and found on the last six lines of page 1 and

lines 1 to 10 of page 2 of said amendment, and substitute therefor the following:

—Such a screen finely breaks up the water and offers sufficient resistance for thoroughly mixing it with air. On the other hand, the resistance of the screen is low enough to permit passage of the air in form of bubbles disseminated in the water. The streamlets of aerated water are sufficiently close together, so that on issuing, they join each other to form a single jet.—

104 Page 5, cancel lines 1 to 13 through the period, and insert the following:

—When the water is turned through this device, if the faucet is opened only slightly, so that very little kinetic energy is developed in the water, as it emerges from the perforations in the screen 16, in proportion to the resistance of the screen 20, then the water will come out of the discharge 22 without air bubbles. On the other hand, as the faucet is opened wider, the velocity of the water emerging from the perforations in the screen 16, increases and acquires the necessary kinetic energy relative to the resistance of the screen 20, to effect entrainment and mixing of the air with the water.

While the total cross sectional area of the perforations in the screen 16, under the usual conditions of operation, is such as to force the water into the chamber with substantial velocity and the screen 20 has the proper relative resistance thereto, to effect the desired result, it is obvious that any change in the cross sectional area of the perforations in the screen 16 will require a change in the resistance of the screen, to establish the proportion necessary for the maintenance of substantially the same result.—

Cancel the amendment dated June 18, 1938 to page 5, last line before "Again".

Page 6, line 7, cancel beginning "and" to the end of the sentence, and substitute —jet—.

Page 8, line 18, before "plates" insert—perforated up-stream—; line 18, cancel "forming the"; line 19, cancel "inlet apertures" and "for the outlet baffles"; line 19, before "screens" insert—down-stream—.

105 Remarks.

The amendment herewith is merely for clarifying certain portions of the disclosure in the specification and to

make it conform more closely with the allowed subject matter of the claims.

Respectfully submitted,
Elie Aghnides
By John Boye, Jr.
His Attorney.

Entry *in part* Recommended Under Rule 78.
Karl R. Fish, Examiner.

Washington, D. C.,
July 1, 1940.

106

(Letterhead—Department of Commerce)
Paper No. 27

Mailed July 8-1940 KRL:TIS

Applicant: Elie Aghnides.
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

John Boyle, Jr.
801 Washington Loan & Trust Bldg.
Washington, D. C.

The entry of the amendment proposed under Rule 78 has been *made in part* disapproved. A copy of the examiner's adverse report appears below.

Conway P. Coe
Commissioner of Patents.

The entry of the proposed amendment is recommended except for the change in applicant's post office address. Under existing practice directions for such change must be over applicant's signature whereas this amendment is by his attorney.

Karl R. Fish
Examiner.

Approved
July 8-1940.
Henry Van Ansdale
Asst. Commissioner of Patent

107

In the United States Patent Office

28

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices

Div. 32
Room 4086

AMENDMENT UNDER RULE 78

Honorable Commissioner of Patents,
Sir:

In the above entitled application, please change my post-office address to—609 West 158th Street, New York, N. Y.

Elie Aghnides
Elie Aghnides

New York, N. Y.
July 10, 1940.
Entered under Order 3311
Karl R. Fish
Examiner.

108

IN THE UNITED STATES PATENT OFFICE

29

In the application of
Elie Aghnides
Serial No. 182,884
Filed Dec. 31, 1937
Fluid Mixing Devices

Allowed
June 25, 1940

Hon. Commissioner of Patents,
Sir:

In the matter of the above entitled application, please enter therein the attached supplemental oath and claims.

Respectfully submitted,
John Boyle, Jr.
Attorney for Elie Aghnides.

Washington, D. C.,
July 8, 1940

109

SUPPLEMENTAL OATH

(Stamp—U. S. Patent Office
Jul 11 1940
Issue Division)

Stamp—Application Division—U. S. Patent Office— Jul 11 '40

State of New York }
County of Bronx } ss.

Elie Aghnides, whose application for letters patent for an improvement in Fluid Mixing Devices, Serial No. 182,884, was filed in the United States Patent Office on De-

cember 31, 1937, being duly sworn deposes and says that he is a citizen of the Kingdom of Greece and now a resident of New York City, New York; that the subject-matter of the annexed claims 54-58 inclusive, was invented before his filed his original application, above identified for such invention, that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, that he does not know and does not believe that the same, except as to matters disclosed in his prior application Serial No. 52,293, was patented or described in any printed publication in the United States of America, or any foreign country more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any foreign country on an application filed by himself or his legal representatives or assigns more than twelve months prior to his application in the United States and has not been abandoned.

Elie Aghnides

Sworn to and subscribed before me this 6th day of July, 1940.

Notary Public.

(Seal)

110 54. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

55. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

111 56. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

57. The device of claim 54 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

58. The device of claim 54 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently

close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

112 Rule 78

FINAL FEE PAID TO THE COMMISSIONER OF PATENTS

Stamp—Mail Division—Jul 11 1940—U.S. Patent Office
Jul-11-40 007048 H 2Check—30.00

Serial No. 182,884
Inventor—Elie Aghnides
Patent to be issued to—do
Name of Invention, as Allowed: Fluid Mixing Devices
Date of Payment: July 11/40
Fee—Final 30
Date of Filing: Dec. 31/37
Date of Circular of Allowance: June 25/40

The Commissioner of Patents will please apply the accompanying fee as indicated above.

John Boyle, Jr.
Attorney.

Send Patent to—John Boyle, Jr.
900 A St., N. W., D. C.

Final fees will not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office, NOR WILL THEY BE APPLIED IN PENDING APPLICATIONS.

113 Div. 32 Room 4086 Paper No. 30

Letterhead—

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Mailed—Jal 13 1940
John Boyle, Jr.
801 Washington Loan & Trust Bldg.
Washington, D. C.

Applicant: Elie Aghnides
Ser. No. 182,884
Filed Dec. 31, 1937
For Fluid Mixing Devices

The amendment proposed under Rule 78 has been entered under authority of Commissioner's Order No. 3311.
Examiner.

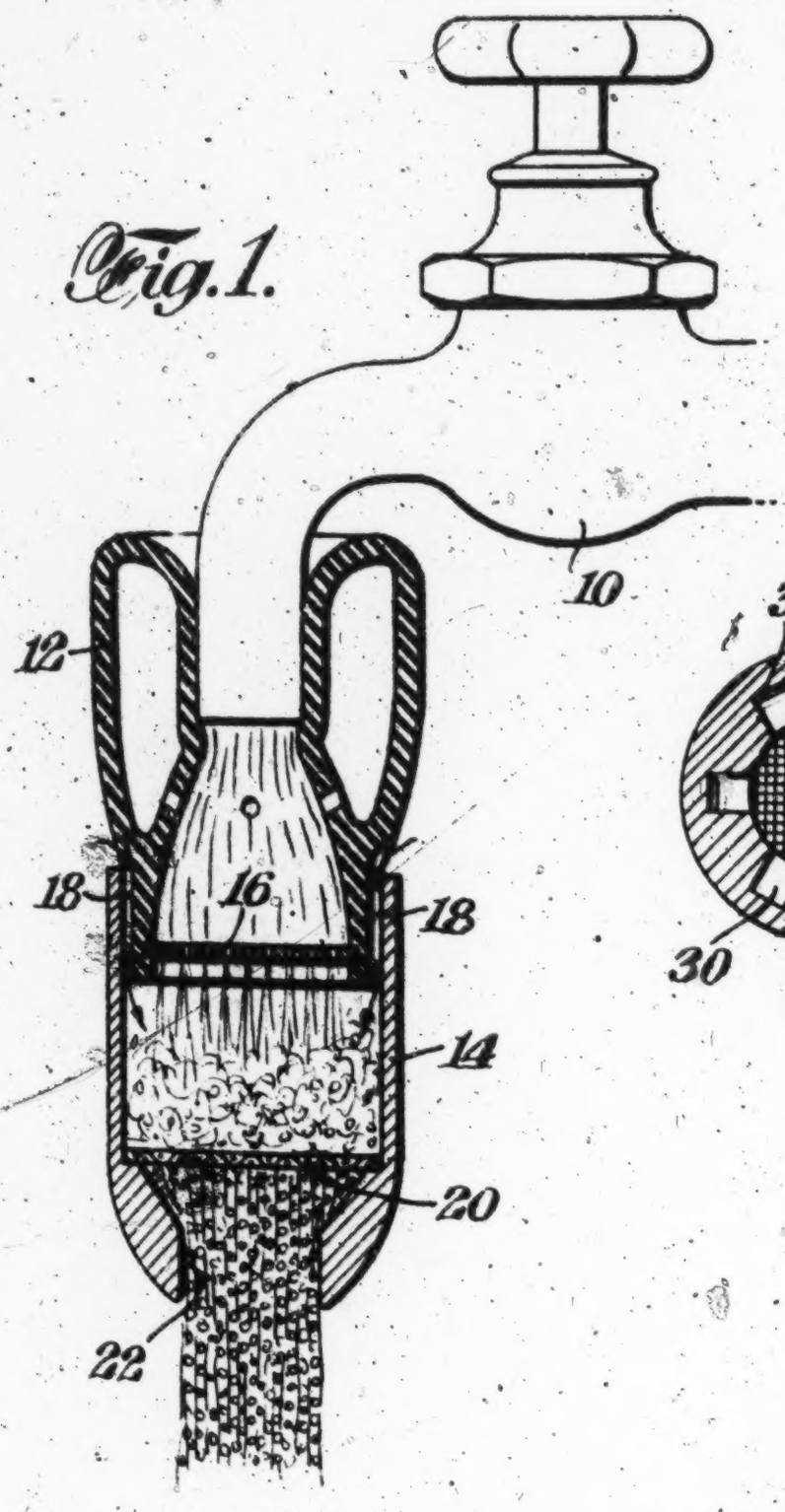
Aug. 6, 1940. E. AGHNIDES

FLUID MIXING DEVICE

Filed Dec. 31, 1937

2 App. 131
2,210,846

Fig. 1.



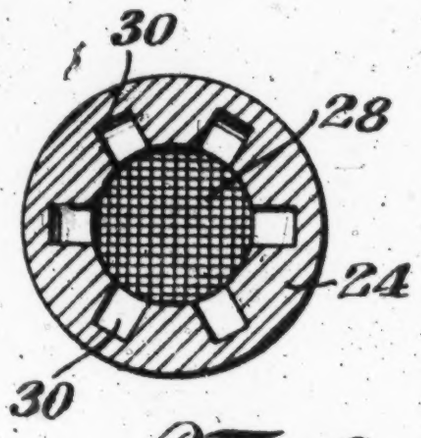


Fig. 3.

Fig. 4.

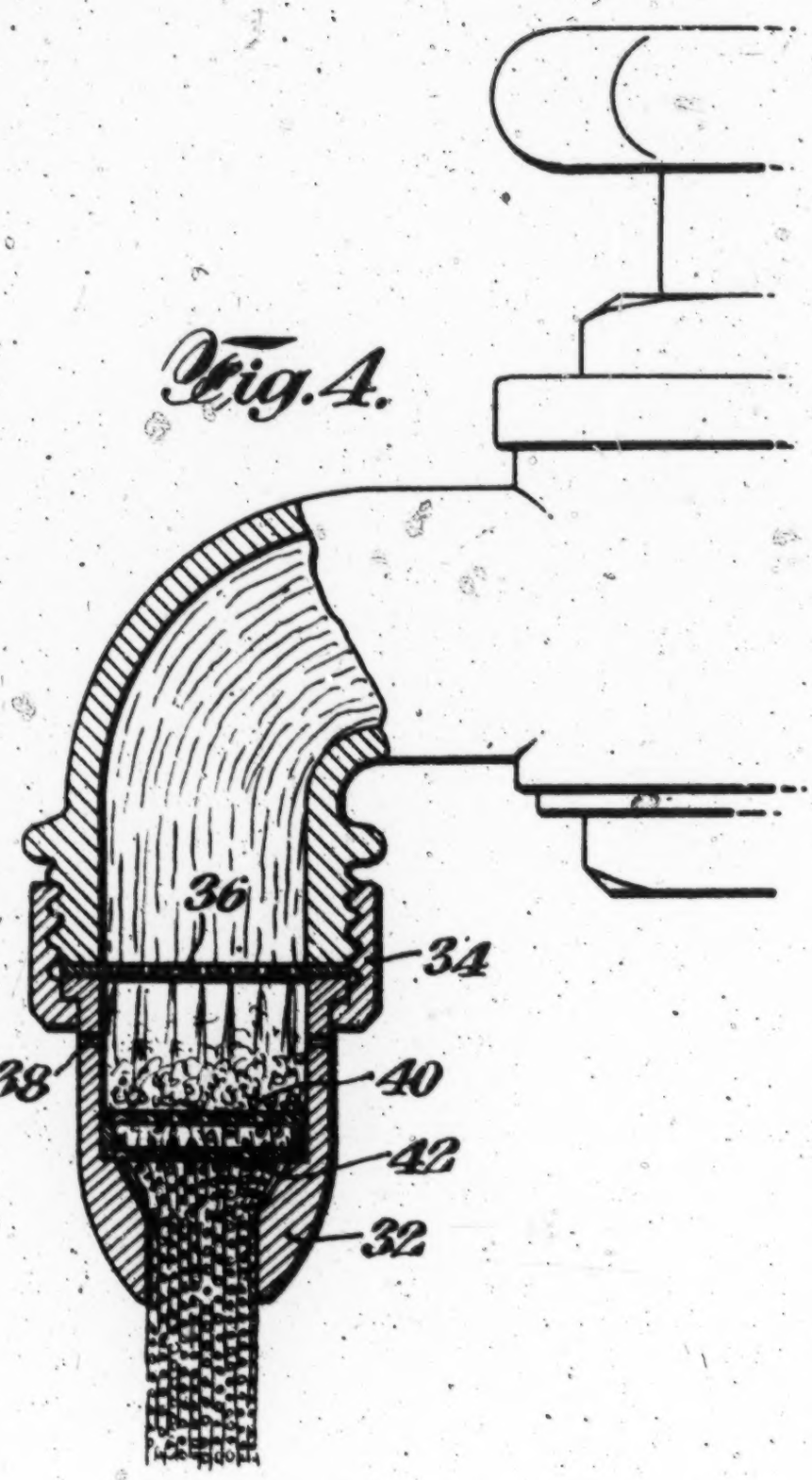


Fig. 8.

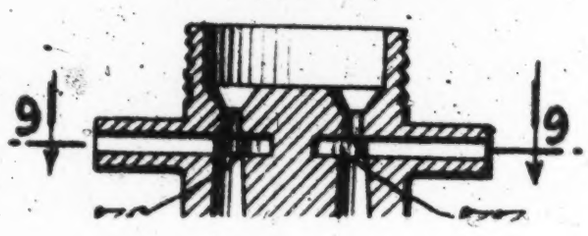


Fig. 2.

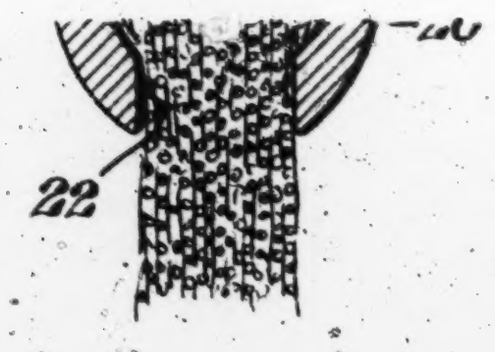


Fig. 5.

Fig. 8.

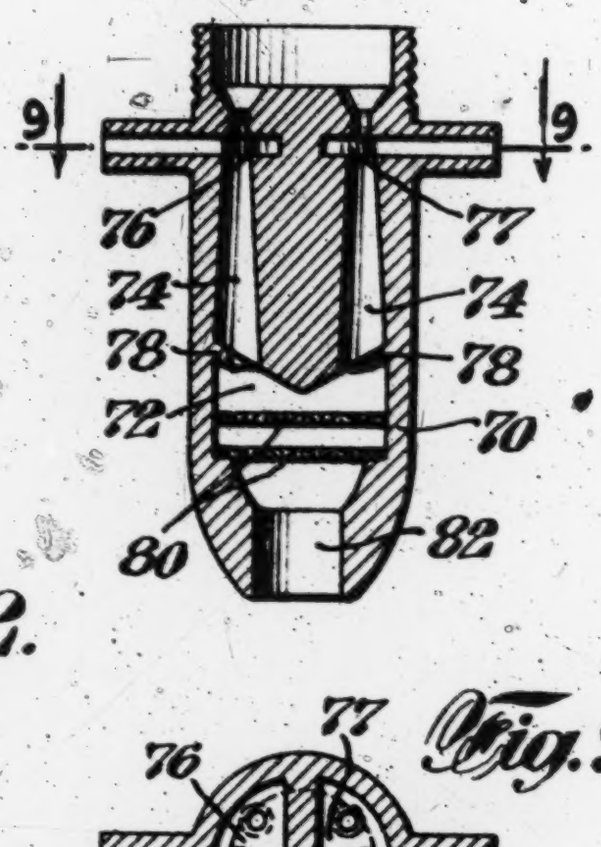


Fig. 2.

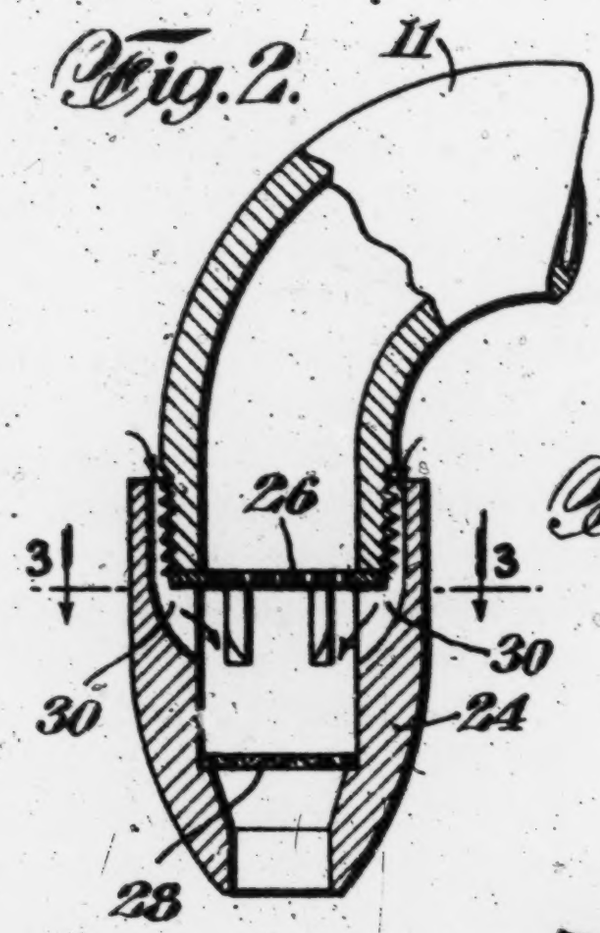


Fig. 9.

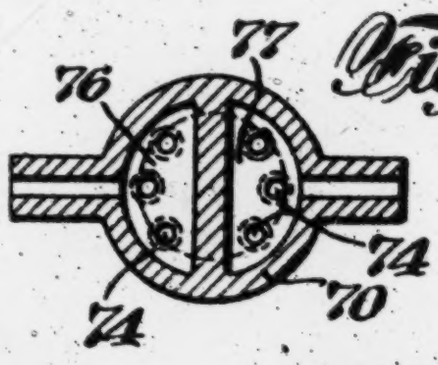
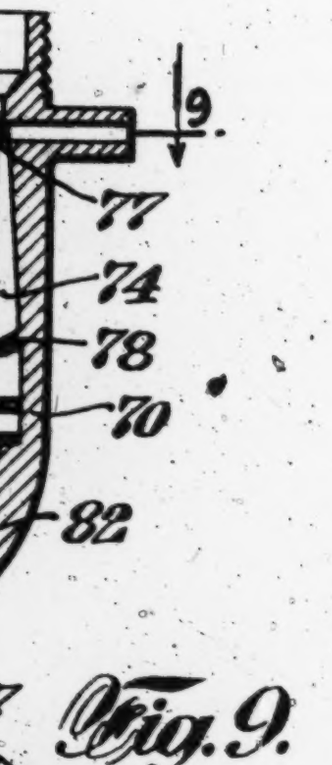


Fig. 6.

Fig. 7.



INVENTOR,
Elie Aghnides,
BY
Frank S. Ashlemon,
ATTORNEY.

UNITED STATES PATENT OFFICE

2,210,046

FLUID MIXING DEVICE

Elie Aghnides, New York, N. Y.

Application December 31, 1937, Serial No. 182,884
In Belgium December 8, 1934

5 Claims. (Cl. 261—76)

This invention relates to a device for intimately mixing a gas with a liquid, and ordinarily is employed for aerating water. This application is a continuation in part of my earlier application Serial No. 52,923, filed December 4, 1935.

Broadly speaking, my invention consists of a device intended to be connected to a source of liquid under pressure, such as an ordinary water tap, and includes a chamber provided with one or more apertures through which the water is forced into the chamber with substantial velocity and as a result the liquid stream has very substantial kinetic energy. Proper openings are provided leading into the chamber from the outside air so that the flow of water will draw air into the chamber according to the well-known Venturi principle. In accordance with my invention, means are provided in the path of the stream of water after it leaves the aperture or apertures and before it discharges at the outlet end for finely breaking up the water and offering sufficient resistance for thoroughly mixing it with air. An outlet for the chamber is provided from which the water mixed with air can emerge. It is advisable to have the outlet of smaller cross section than the cross section of the chamber so that the water will flow in a coherent stream; but the outlet should be of sufficient size relative to the aperture or apertures through which the water is introduced into the chamber so that the water mixed with air will emerge at a substantially lower velocity than the water entering the chamber. Of course, when I refer to the outlet forming a coherent stream, I do not mean to imply that the outlet cannot be divided into several such streams, if desired.

The essential feature of my invention is an arrangement of a dividing means in the path of the liquid emerging from the aperture or apertures delivering liquid to the aforesaid chamber, this dividing means being adapted to finely break up the fluids and to imprison in the liquid, air particles forming therein such small bubbles that they remain in suspension in the jet.

In the devices suggested until now, the air drawn in by the liquid separates immediately at the outlet of the apparatus and no known apparatus has for its object, as is the case with my invention, the formation of a coherent "white" jet, this being due to the fine division of the air and to the formation of a true suspension of a multitude of air bubbles in the water.

In the preferred embodiment of my invention, the water is introduced into the mixing chamber through a plurality of apertures. Also I find that a highly efficient form of dividing means is a fine screen located at the outlet, and I have found that even better results can be obtained if two or more superposed screens are used in the outlet discharge. The size of the mesh employed is not critical but I have obtained good results where the holes in the screen measured about .6 square millimeter.

Such a screen finely breaks up the water and offers sufficient resistance for thoroughly mixing it with air. On the other hand, the resistance of the screen is low enough to permit passage of the air in the form of bubbles disseminated in the water. The streamlets of aerated water are sufficiently close together, so that on issuing, they join each other to form a single jet.

My invention can readily be understood by reference to the accompanying drawing, in which Fig. 1 is a sectional view of a device embodying my invention which is shown as attached to an ordinary water faucet through the medium of a connecting device such as is described in my Patent No. 2,071,780; Fig. 2 is a sectional view of a device adapted to be screwed onto an ordinary water pipe; Fig. 3 is a section on line 3—3 of Fig. 2; Fig. 4 is a sectional view showing a further modified form; Figs. 5, 6, 7 and 8 are additional sectional views showing further modifications; and Fig. 9 is a section on line 9—9 of Fig. 8.

Referring now to Fig. 1, 10 designates an ordinary faucet or tap. 12 is a tap connector, the operation of which is described in detail in my patent above referred to. 14 is the casing of the mixing device enclosing the primary mixing chamber. The perforated screen 16 admits the water into the casing 14 in the form of a plurality of jets. A plurality of air ports 18 are provided for admission of air into the interior of the casing 14. 20 is a screen at the lower part of the casing, and below the screen 20 the casing narrows to form a passage 22.

When the water is turned through this device, if the faucet is opened only slightly, so that very little kinetic energy is developed in the water, as it emerges from the perforations in the screen 16, in proportion to the resistance of the screen 20, then the water will come out of the discharge 22 without air bubbles. On the other hand, as the faucet is opened wider, the velocity of the water emerging from the perforations in the screen 16, increases and acquires the necessary kinetic energy relative to the resistance of the screen 20, to effect entrainment and mixing of the air with the water.

While the total cross sectional area of the per-

2 App. 134

forations in the screen 16, under the usual conditions of operation, is such as to force the water into the chamber with substantial velocity and the screen 20 has the proper relative resistance thereto, to effect the desired result, it is obvious that any change in the cross sectional area of the perforations in the screen 16 will require a change in the resistance of the screen, to establish the proportion necessary for the maintenance of substantially the same result. This water, again contacting with the screen 20, will pass through the screen with the air and emerge from the outlet 22. As the diameter of outlet 22 is substantially greater than the aggregate diameter of the perforations in screen 16, the water will have relatively low velocity as it comes out from the discharge.

When my device is functioning, the water, due to the thorough admixture of air, has characteristics which are surprisingly different from those of water as ordinarily discharged from a faucet. For example, if one's hand is put in the course of the water, the water will flow evenly and uniformly over the surface and will wet the entire surface without splashing. Also it will be found that if the discharge from such faucet is allowed to flow into a weak soap solution, it will make an extraordinary amount of foam, which will be found very useful for washing; for instance, when washing clothes or dishes. Again it will be found that the introduction of the air into the water will raise its dissolved oxygen content and the aeration tends to remove objectionable odors and gases from the water, rendering it more palatable. These effects are apparently due to the extreme thoroughness with which the aeration takes place in my device and the results are quite different from the results obtained by ordinary injection devices in which the air is not thoroughly broken up so that when the two fluids leave the apparatus, the air quickly separates from the water jet.

In the form of device shown in Fig. 2, a metal casing 24 is screwed directly onto the faucet 11. This casing holds the screen 20 against the mouth of the faucet and the casing is provided with an outlet screen 28. A series of ports 30 are provided in the casing to admit air in a manner similar to that already described in connection with Fig. 1.

In Fig. 4 the casing 32 is provided with a union coupling 34 for connection to an ordinary hose bib. The screen 36 is clamped between the casing 32 and the mouth of the hose bib. Air is admitted to the interior of the casing by a series of horizontal perforations 38. In this case two screens are provided at the outlet as indicated at 40 and 42, which will cause the air bubbles in the water to be somewhat smaller than where only a single screen is employed.

Fig. 5 illustrates a case where a single aperture is employed for admitting fluid to the chamber. In this figure, the casing 44 is screwed to the faucet 46 and clamps in place a plate 48 having a single aperture in the middle. A plate 50 supported by legs 52 is positioned in the lower part of the chamber and below this is positioned a screen 54. The water from the aperture in plate 48 strikes plate 50 and due to its kinetic energy the stream is broken up and thoroughly mixed with the air.

In Fig. 6 the plate 56 has a plurality of holes near the periphery and the casing 58 is formed with inwardly extending projections as indicated at 60. The principal part of the water coming through the openings in the plate 56 will strike these projections and be broken up as previously described. In this case, a screen 62 is also used in the device.

An effect similar to that shown in Fig. 6 is illustrated in Fig. 7 except that instead of having a plurality of apertures in the plate, the plate 66 has a single central orifice shaped to throw the water outwardly. The casing 68 again has projections as indicated at 68 similar to the projections 60 described above.

Another form of my device is shown in Figs. 8 and 9. In this arrangement it is possible to mix three fluids, one of which is under pressure. Leading into a mixing chamber 72 are a plurality of passages 74 to permit entrance of a fluid under pressure into the mixing chamber 72 enclosed by casing 76. The inlet port 76 intersects and leads into one group of passages 74 near the upper end of the passages; and another inlet port 77 likewise intersects and leads into another group of passages 74. The inlet ports 76 and 77 do not connect with one another; in consequence the channels 74 are grouped into two sections, each section being connected to an inlet port. In this form of my device each inlet port may admit a different fluid into the mixing chamber. The cross-sectional area of passages 74 is greater after intersection by inlet ports 76 and 77 and the cross-sectional area of the passages continues to increase as the passages approach the mixing chamber. As in preceding examples, the fluid under pressure courses through passages 74 and draws fluids from inlet ports 76 and 77 into the enlarged portion of passages 74. Baffles 78 project into the passages at the point where the passages discharge into the mixing chamber. The baffles in part interrupt the course of the fluids in each passage and thereby serve to effect a preliminary mixing of the fluids. Within the mixing chamber two screens 80 in spaced relation are placed across the path of the fluids emerging from the passages 74 to interrupt abruptly the course of all such fluids and thereby cause the fluids to mix and sub-divide into minute particles. The fluids are discharged through the outlet 82.

While I have referred to perforated upstream plates and downstream screens, it is possible to use perforated plates or (except in certain forms) screens in either position. In the various forms of device shown, the screens and the plates forming the apertures are made readily removable so that the devices can easily be claimed.

What I claim is:

1. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

2. A device for producting a coherent jet of water containing air bubbles, comprising a cham-

ber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

3. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

4. The device of claim 1 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

5. The device of claim 1 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

ELIE AGHNIDES.

☆☆☆☆☆☆☆☆☆☆☆

☆☆☆☆☆☆☆☆☆☆☆

CERTIFICATE OF COMMISSIONER OF PATENTS OF THE UNITED STATES PATENT OFFICE CERTIFYING THAT THE ANNEXED IS A TRUE COPY FROM THE RECORDS OF THAT OFFICE OF THE FILE WRAPPER AND CONTENTS OF PATENT 2,316,832, GRANTED APRIL 20, 1943 TO ELIE AGHNIDES FOR FLUID MIXING DEVICES.

Seal

Signature

☆☆☆☆☆☆☆☆☆☆☆

☆☆☆☆☆☆☆☆☆☆☆

Note

Page 2 App. 136 is blank;

Pages 2 App. 137-143 are on Card 8;

Pages 2 App. 144-145B are on Card 11.

Note

Pages 2 App. 147-152 are on Card 11;

Pages 2 App. 153-162 are on Card 12;

Pages 2 App. 163-167 are on Card 13.

Printers error in page numbering

Note

Pages 2 App. 167B-171 are on Card 13;

Pages 2 App. 172-181 are on Card 14;

Pages 2 App. 182-191 are on Card 15;

Pages 2 App. 192-197 are on Card 16;

Pages 2 App 198-199 follow this frame.

2 App. 205

April 20, 1943. E. AGHNIDES 2,316,832

FLUID MIXING DEVICE

Filed April 5, 1940

FIG. 1.

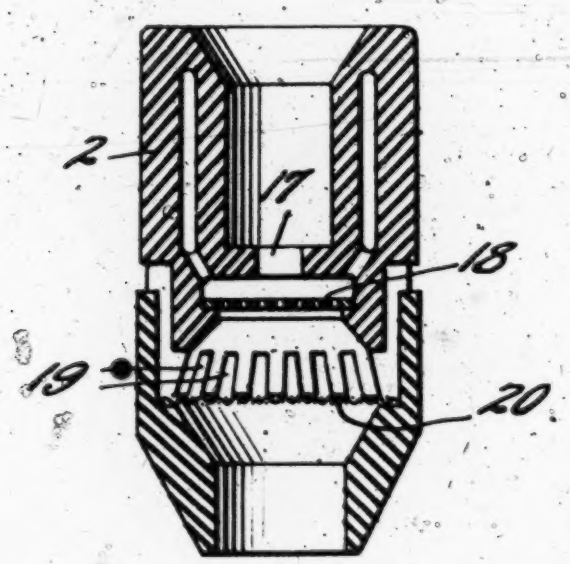


FIG. 2.

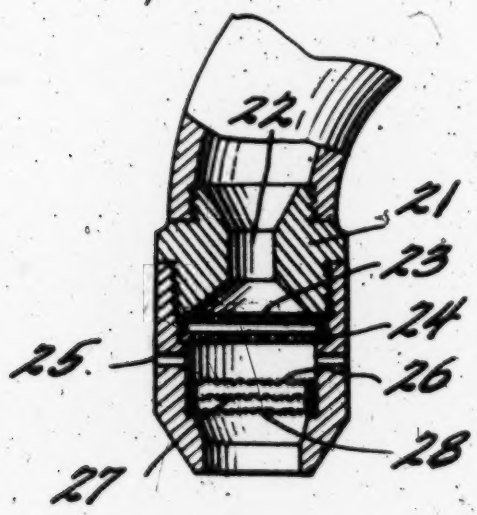
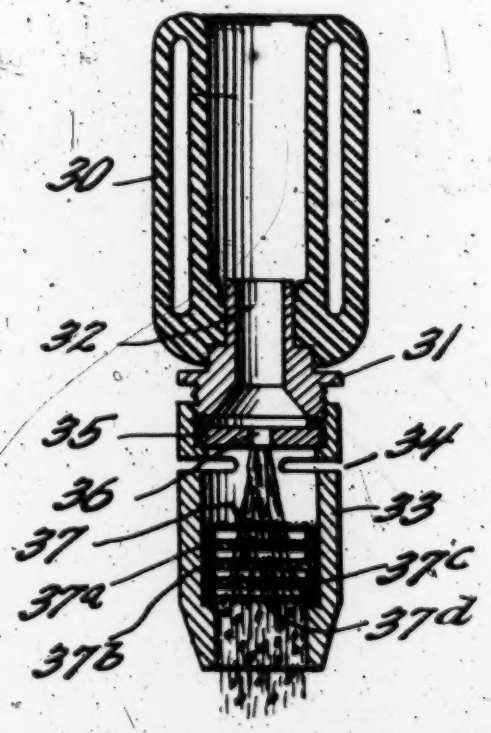


FIG. 3.



Inventor

Elie Aghnides,

By John Boyle Jr.

Attorney

2 App. 207

Patented Apr. 20, 1943

2,316,832

(Page 2 App. 206 is blank.)

UNITED STATES PATENT OFFICE

2,316,832

FLUID MIXING DEVICE

Elio Agbuddoo, New York, N. Y.

Application April 5, 1940, Serial No. 328,128
In Belgium December 4, 1934

4 Claims. (Cl. 261—76)

My invention relates to a device for intimately mixing a large volume of a gas, such as air, with a liquid such as water, and ordinarily is used for producing a jet of water containing air bubbles disseminated throughout the jet and is an improvement on my Patent 2,210,946 granted Aug. 6, 1940. Such a jet is whitish in appearance, soft and light to the touch and possesses numerous advantages not found in the ordinary water jet as discharged from a faucet.

Generally speaking, my invention consists therefore of a device comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube, such as an ordinary household water faucet, containing water under the normal main pressure of about 3 atmospheres. The outlet end of the device is adapted to discharge a coherent jet containing air bubbles disseminated throughout the jet. At the upstream end of the chamber is an apertured diaphragm through which the stream of water is adapted to be forced into the chamber with substantial velocity. An air port opening into the chamber is provided through which air is induced by the stream of water. At least one foraminous screen is provided in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end, for finely breaking up the stream of water which is thoroughly mixed with the air.

Means are provided for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet. This may be in part, a multiplicity of orifices in the upstream diaphragm; or in the addition of at least a second foraminous screen between the first screen and the outlet end, with openings so close to each other that the issuing aerated water unites to form a coherent jet; or, in the addition of a tubular portion at the outlet end and adapted to contract the stream of aerated water issuing from the screen, to form a coherent jet.

Referring to the drawing

Fig. 1 is a vertical section of one form of my invention.

Figs. 2 and 3 are similar sections of modified forms.

In Fig. 1, I employ the same type of rubber tap connector 2 as in Fig. 1 of my aforesaid patent, except that I provide a constricted orifice 17, above the upstream apertured diaphragm 18, and the air inlets 19 terminate close to the surface of the downstream screen 20.

In Fig. 2, I employ a screw coupling 21 having a restricted orifice 22 for connecting my device to a faucet and I employ two spaced apertured diaphragms 23, 24 located above the air inlets 25 and I use three spaced screens 26, 27, 28, in the downstream end of the device.

In Fig. 3, I employ the same general type of rubber tap connector 30 as in Fig. 1. The metal coupling 31 having a restricted orifice 32 is secured thereto. Screwed to the coupling is the lower portion 33, provided with air inlets 34, an upstream diaphragm 35 having a single orifice 36 and five spaced wire screens 37, 37a, 37b, 37c, and 37d. The number of screens used depends on the orifice area, the distance between the diaphragm and screens and the mesh of the wire screens.

I have found that when the water is discharged through a restricted orifice, as at 17, Fig. 1, at 22 Fig. 2, and at 32 Fig. 3 that the flow through the orifices in the upstream diaphragm is improved and a more regular and softer jet is delivered from the outlet end of the device.

A similar result is obtained when instead of the restricted orifice upstream of the diaphragm, a second foraminous diaphragm as 23, Fig. 2, preferably with greater aggregate cross section of the foramina, is located upstream of the first diaphragm 24, at a distance of about 1 mm. Both the restricted orifice and the second diaphragm can be used together for a more uniform flow of the bubbly jet.

This application is a continuation in part of my applications Ser. No. 183,894 filed Dec. 31, 1937 patented August 6, 1940, Number 2,210,946 and Ser. No. 53,938 filed Dec. 4, 1935.

I claim:

1. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

2. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the

Note

Pages 2 App. 200-203 are on Card 16;

Page 2 App. 204 is on Card 17.

2 App 208

outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice upstream the apertured diaphragm.

2. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice and foraminous member upstream the apertured diaphragm.

4. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, superposed apertured diaphragms at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragms and means in the path of the stream of water after it leaves the apertured diaphragms and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles.

ELIE AGHNIDES.

Note

Pages 2 App. 209-218
are on Card 17.

Defendant's Exhibit 14 . 2 App. 219

PATENT SPECIFICATION

Convention Date (Belgium): Dec. 8, 1934.

468,687

Application Date (In United Kingdom): Dec. 6, 1935. No. 33884/35.

Complete Specification Accepted: July 6, 1937.

COMPLETE SPECIFICATION

Device for Intimately Mixing Air with a Liquid Flowing under Pressure

I, ELIE AGHNIDES, a Greek subject, of 16, rue Capouillet, Brussels, Belgium, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a device for intimately mixing air with a liquid flowing under pressure.

The device according to the invention comprises an injector portion provided upstream of the part where it aspirates air with a perforated cross partition that divides the stream of liquid into a number of small streams, and downstream the said part with an atomizing and mixing portion comprising one or more finely perforated plates, so that the resulting jet has a substantially uniform pressure throughout its cross section and consists of a uniformly distributed, finely broken mixture of liquid and air having the particles of liquid and air in intimate contact with each other even after issuing from the said device.

It has been proposed to provide a liquid aerating device comprising a tubular member having a lower hollow part and a relatively solid upper part in which were arranged liquid passages alternating with short passages communicating with atmosphere at the sides of the device, whilst the lower hollow part supported a number of pegs below and transverse to the liquid posal was designed as a device for exhausting air or gases from a chamber or space.

Owing to the invention atmospheric or surrounding air can be intimately mixed with a flowing water column under pressure to obtain at the outlet of the device a good water and air mixture. The mixture thus obtained possesses remarkable qualities: the water thus charged acquires an agreeable flavour, like water coming from a natural spring; this water is more digestive, it softens the skin and, due to the simultaneous and automatic introduction of intimately mixed air, produces with soap a very foamy emulsion which means better washing and a considerable economy of soap and time, for instance when washing clothes. The enriching of the water confers to the water a higher oxidising power.

Another practical application consists, for instance, in drawing off beer. Repeated experiments have proved that beer caused to flow by carbon dioxide under pressure and compelled to run through the device according to the invention is intimately mixed with the surrounding air, acquires a better taste and a finer appearance, the foam being more resistant.

The invention can be carried into effect in various manners.

In the accompanying drawings:—

Fig. 1 is an axial cross-section of a water aerating device for a domestic water pipe.

intimately mixing air with a liquid flowing under pressure.

The device according to the invention comprises an injector portion provided upstream of the part where it aspirates air with a perforated cross partition that divides the stream of liquid into a number of small streams, and downstream the said part with an atomizing and mixing portion comprising one or more finely perforated plates, so that the resulting jet has a substantially uniform pressure throughout its cross section and consists of a uniformly distributed, finely broken mixture of liquid and air having the particles of liquid and air in intimate contact with each other even after issuing from the said device.

It has been proposed to provide a liquid aerating device comprising a tubular member having a lower hollow part and a relatively solid upper part in which were arranged liquid passages alternating with short passages communicating with atmosphere at the sides of the device, whilst the lower hollow part supported a number of pegs below and transverse to the liquid passages. The present invention differs from this proposal in that the said invention provides a perforated plate or plates which atomize and mix the aid and liquid in the manner set forth in the preceding paragraph.

In apparatus for exhausting air or gas it has been proposed to employ a number of perforated plates in a flow passage for water mixed with air or gas aspirated by the water. The device according to the present invention differs from this proposal, however, in that it has a perforated cross partition upstream of the part where air is aspirated so that the liquid is divided into a number of separate passages, and whereas the present device is designed to aerate liquid the said properties: the water thus charged acquires an agreeable flavour, like water coming from a natural spring; this water is more digestive, it softens the skin and, due to the simultaneous and automatic introduction of intimately mixed air, produces with soap a very foamy emulsion which means better washing and a considerable economy of soap and time, for instance when washing clothes. The enriching of the water confers to the water a higher oxidising power.

Another practical application consists, for instance, in drawing off beer. Repeated experiments have proved that beer caused to flow by carbon dioxide under pressure and compelled to run through the device according to the invention is intimately mixed with the surrounding air, acquires a better taste and a finer appearance, the foam being more resistant.

The invention can be carried into effect in various manners.

In the accompanying drawings:—

Fig. 1 is an axial cross-section of a water aerating device for a domestic water pipe.

Fig. 2 to 5 are diagrams of various forms of the invention.

In Figure 1, the numeral 1 indicates for instance a water pipe under pressure and 2 a tap of any type whatever. A tubular part 3 is fixed at the end of the tap; the connection can be made in any desired manner provided that it is tight, and in the example this is realized by means of a special self tightening connection 4 according to the Specification of my British Patent Application No. 15918/35 (451,142).

The tubular part is provided with and closed inside by means of a transversal partition 5 provided with holes 6 the object of which is to divide the current of water to increase the contacting surface between

[*Price* 1/-]

Price 3s. 0d.

the water and the air; the total section or surface of the holes is smaller than the section through which the fluid flows at the end of the tap. Below the partition 5, in respect to the current of water, the side wall of tube 3 is provided with a ring of holes 7.

The manner in which the device works will be immediately understood.

Numeral 9 represents diagrammatically two perforated plates or any other dividing devices, to form one or several chambers or spaces ensuring atomisation of the fluids and uniformity in the mixture before its exit.

The total area of the holes in the partition 5 may be equal to the area of the annulus (Fig. 5) or the total area of the holes 7 through which the incoming air or gas passes (Fig. 1). The holes 7 may be replaced by a complete interruption of the tubular wall as is the case in Figures 2 to 5.

In Figure 2, the lower pipe 20, which is larger than the pipe above, comes to an end in front of the latter in the form of a contracting-expanding part 21. In Figure 3, the device is manifold and comprises several stepped air admission rings, and in Figure 4, which corresponds to Figure 3, the piping above and the piping below are jointed by a clip or by means of flanges 23 allowing the air to pass. The embodiments illustrated in these figures have the perforated partitions 5 on the upstream side of the devices and perforated plates 9 on the downstream side.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A device for intimately mixing air with a liquid flowing under pressure, comprising an injector portion provided upstream of the part where it aspirates air with a perforated cross partition that divides the stream of liquid into a number of small streams, and downstream the said part with an atomising and mixing portion comprising one or more finely perforated plates, so that the resulting jet has a substantially uniform pressure throughout its cross section and consists of a uniformly distributed, finely broken mixture of liquid and air having the particles of liquid and air in intimate contact with each other even after issuing from the said device.

2. Device according to claim 1, substantially as herein described with reference to the accompanying drawings.

Dated this 5th day of December, 1935.

HY. FAIRBROTHER,
Chartered Patent Agent,
30 & 32, Ludgate Hill, London, E.C.4.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1937

Defendant's Exhibit 15 also 44-5 2 App.221

May 30, 1933. E. AGHNIDES 1,912,113

WATER PUMP

Filed June 11, 1931

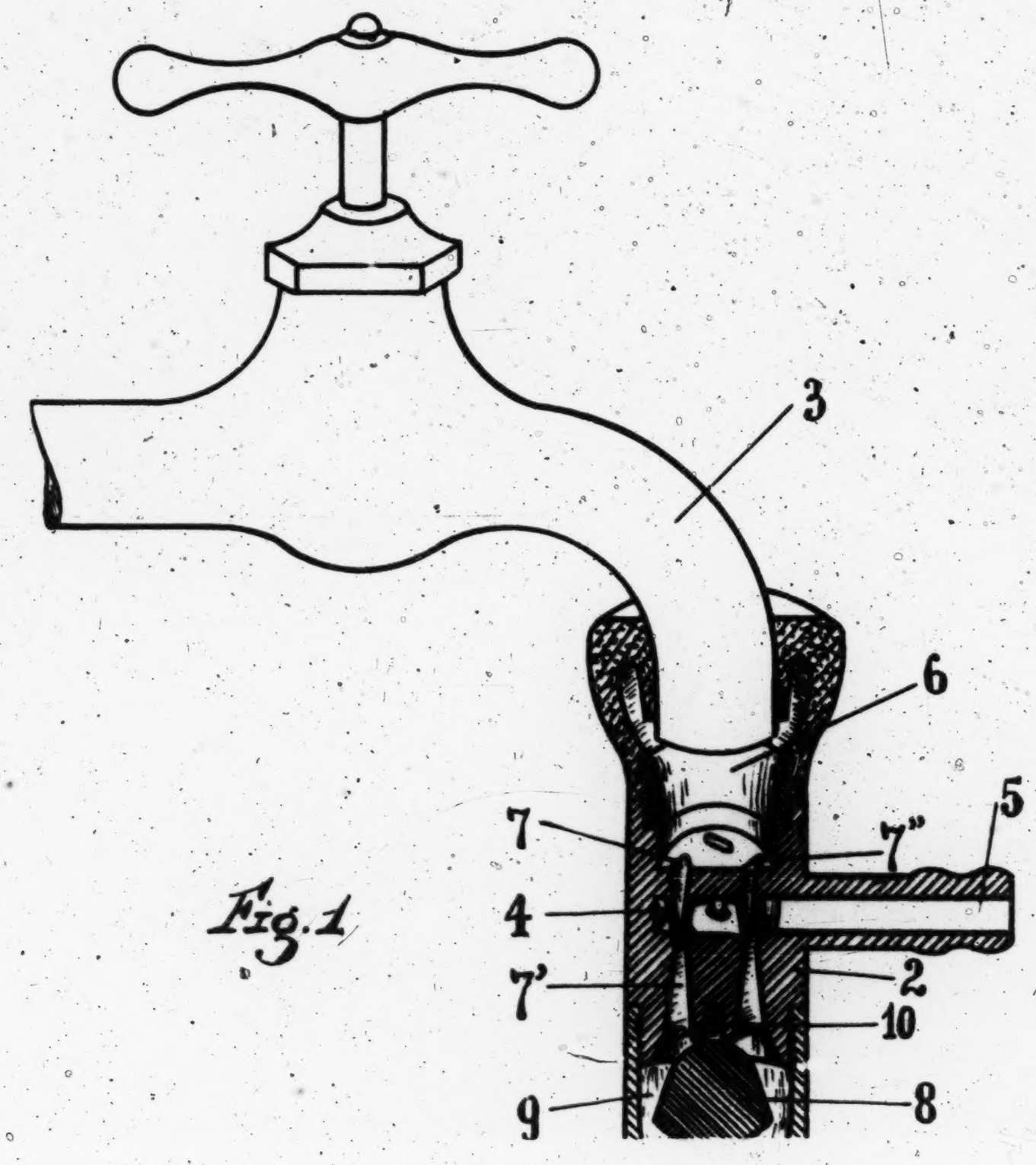


Fig. 1

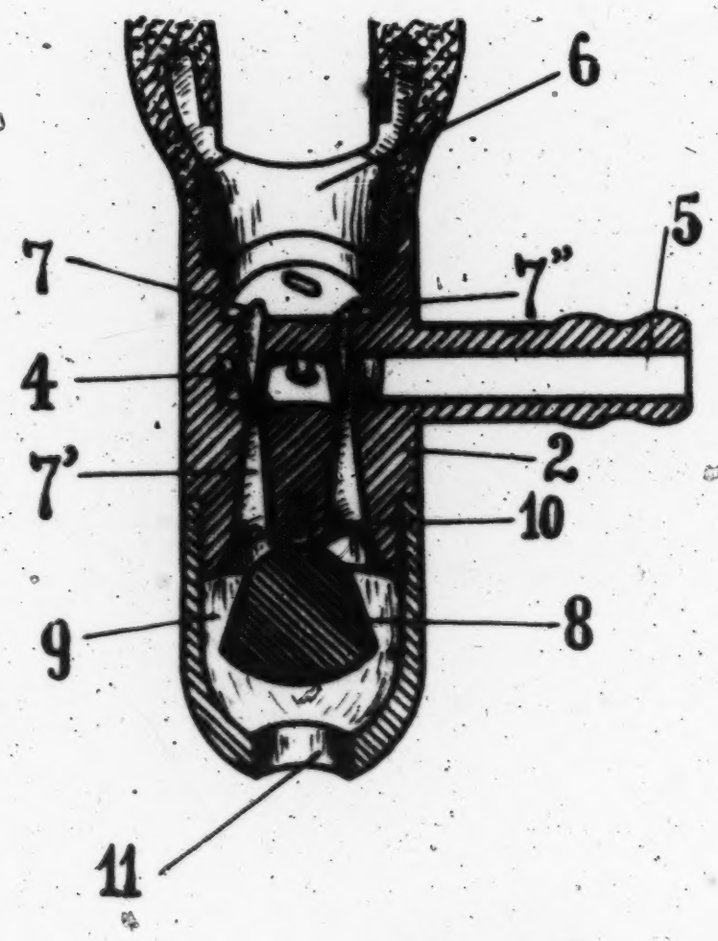


Fig. 1

Fig. 2

Inventor:
Elie Aghnides
by his Attorney:

Defendant's Exhibit 15 also 44-5 2 App. 223
(p. 2 App. 222 is Blank)

Patented May 30, 1933 1,912,113

UNITED STATES PATENT OFFICE

ELIE AGNIDES, OF ANTWERP, BELGIUM

WATER PUMP

Application filed June 11, 1931, Serial No. 542,926, and in Belgium June 13, 1930.

This invention relates to water pumps adapted to produce a depression in a vessel or space, by the known suction effect of water in a nozzle.

One object of the invention is to do away with the very long or long outlet tube that it was always necessary to provide to prevent the inrushing back of air into the vacuumized vessel. In order to attain this I provide an arrangement by which the jets of mixed water and gas are directed in an annular space or canal such that the transverse section of the central portion of the same, considered in the same direction as the flow of water and gas first increases, then diminishes to become in the end null.

Also the exterior contour of the said annular space or canal, considered in the direction of the flow of water and gas first comes nearer or converges to the said central portion, then diverges from the same.

Also it is provided an outlet having a section smaller than the largest transverse section of the said central portion.

One realizes in that manner a particular path for the liquid, path which is characterized in that it is curved without breaking or fragmenting the flow of liquid.

According to this invention such an annular canal is realized by providing in a canal of no particular shape a pear-shaped deflector which provides the said central portion and which has a transverse section first augmenting, thereafter decreasing to become finally nil.

I have illustrated a form of realization of this invention by way of example only in the accompanying drawing in which:

Fig. 1 is a perspective view partly in section of my improved water pump.

Fig. 2 shows a modified form of the deflector.

In Fig. 1 the water jet 1 is mounted on a tap 2 and comprises an air chamber 4 connected by a pipe 5 to a vessel or space, not illustrated, and in which vacuum is to be made.

The flow of liquid projected into 6 is divided in several jets by conduits such as 7 or 7'' having a section converging towards the air chamber 4. These jets are directed into conduits 7' which have a section diverging towards the outlet.

The conduits 7, 7', 7'' have a section other than circular, so as to provide a larger surface of contact between the water and the air in chamber 4. In Fig. 1 the canal 7'' is the most clearly visible, having a very elongated section, which may be elliptical or rectangular, whereas conduit 7 is triangular in section.

The conduits 7' lead into an annular canal 9, the central solid portion 8 of which has a section which first increases, then decreases to become nil, taking the direction of the flow of fluid. The said central portion 8 is constituted by a pear-shaped deflector, secured, for instance screwed, by a projection 10, and having a transverse section such as aforesaid.

It is obvious that in view of increasing or decreasing the said shape of the circular canal 9 the exterior wall thereof can be made concave and/or convex.

In order to provide a further curved path for the liquid, the canal 9 is provided with an outlet opening 11 smaller than the largest section of the said central portion and provided of course below the said central portion.

By this means it has been found that although with the very short length of the jet, and without a supplementary evacuation pipe, no air could enter by the outlet to return to the vacuum chamber, and the efficiency of the apparatus is very much increased.

I may also provide a somewhat modified pear-shaped deflector according to Fig. 2, that is, having a bottom or outlet face concave or cup-shaped. This cup designated by 12 has for effect to prevent still more efficiently any retrogradation of the air, the air filets coming back into the apparatus being immediately directed and stopped in the centre of said cup 12.

Preferably the outlet 11 will be provided with a wire gauze acting as anti-spout device.

I wish to point out that my invention is not to be considered as restricted to these particular forms of construction illustrated, and other forms may be considered, as long as

2 App. 224

Defendant's Exhibit 15 also 44 5

they are within the scope of the following claims.

Having now fully described my said invention, what I claim and desire to secure by Letters Patent, is:

1. A water jet pump comprising a tubular body, air suction pipes leading into a chamber in said body, a plurality of water conduits leading into said chamber, a plurality of air and water conduits leading from said chamber into an annular conduit providing a converging passage, subsequently a diverging passage for the mixture of fluids, and an outlet opening immediately after said diverging passage.

2. A water jet pump comprising a tubular body, an air suction pipe leading into a chamber in said body, a plurality of water conduits leading into said chamber, a plurality of air and water conduits leading from said chamber into a fluid laminating annular passage, a pear shaped deflector provided in said passage, and an outlet having an opening smaller than the largest diameter of the said pear shaped deflector.

3. A water jet pump comprising a tubular body, an air suction pipe leading into a chamber in said body, a plurality of water conduits leading into said chamber, a plurality of air and water conduits leading from said chamber into a fluid laminating annular passage, a pear shaped deflector secured centrically in said passage and having a concave outlet side, an outlet having an opening smaller than the largest diameter of the said pear shaped deflector.

ELIE AGHNIDES.

Note

Page 225 is on
Card 18.

800

2 App. 226 Defendant's Exhibit 25

[Page 2 App. 227 in Card 18]

NAME & DESCRIPTION OF PART

#800 SOFTFLO ASSEMBLY

NATURE OF CHANGE

Add 1 disc 1-129
1 gasket 1-130
1 screen 1-124
1 separator ring 1-126

REASON FOR CHANGE

To improve stream

ESTIMATED COST OF CHANGE

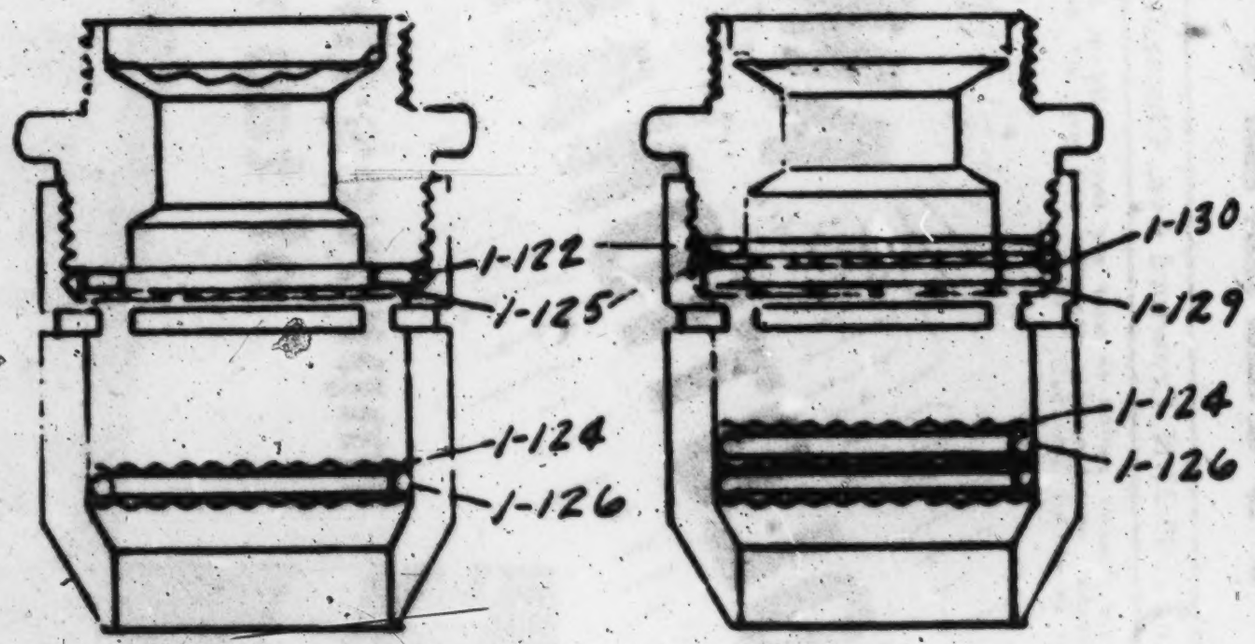
SEE C.O. 1-121-K

OTHER PARTS AFFECTED

1-121 See Change order

REMARKS -

CHANGE ORDER NO. 1
DATE 2-5-40
OLD PART NO. 800
OLD DRAWING NO. 800-A
NEW PART NO.
NEW DRAWING NO.
QUANTITY OF OLD PARTS ON HAND
EFFECTIVE DATE OF CHANGE



PRESENT PROPOSED

SCALE 2" = 1"

SUGGESTED BY H. Steen APPROVED BY ACB

DRAWINGS CHANGED BY H.A.T. MATERIAL SHEETS BY

THE CHICAGO FAUCET COMPANY
2700 TO 2722 NORTH CRAWFORD AVENUE
CHICAGO

2 App. 228 **Defendant's Exhibit 34**

13

ADR TELEGRAPHIQUE
OXYJET-BRUXELLES

E. P. AGHNIDES

14, BOULEVARD DE WATERLOO BRUXELLES

TELEPHONE 11'38 00
CH POST 1870 14

VITA JET

February 14, 1938.

VOTRE REF

NOTRE REF

THE CHICAGO FAUCET COMPANY,
2700 to 2722 North Crawford Avenue,
Chicago.-

Dear Mr Brown,

On my return from a trip I found your letters of February 4, 9 and 17, contents of which are duly noted.

Guaranty Trust Company.- The sums you remitted have been transferred to me and I informed you in a previous letter that all payments must in future be made to the Banque Belge pour l'Etranger (Overseas) Ltd, 67, Wall Street, New York City.

This bank is the branch office of my bank in Belgium, that is why I quitted the Guaranty Trust of New York.

Your ad in the "Chicago Faucet News".- The page you arranged is really very striking and the name you adopted is successful.

The version as arranged by you seems to me all right. You better know the American mentality and simply as a mere suggestion I will send you a draft, for your guidance, in the way I visualize an ad of this kind.

CHICAGO FAUCETS
MAR 22 1938
RECEIVED

Chemists' report.- Enclosed please find a copy of the report on oxy-jet by Messrs Bull and Roberts, of New-York.

I am looking forward to receive your "softflo" faucet which I hope will really be revolutionary.

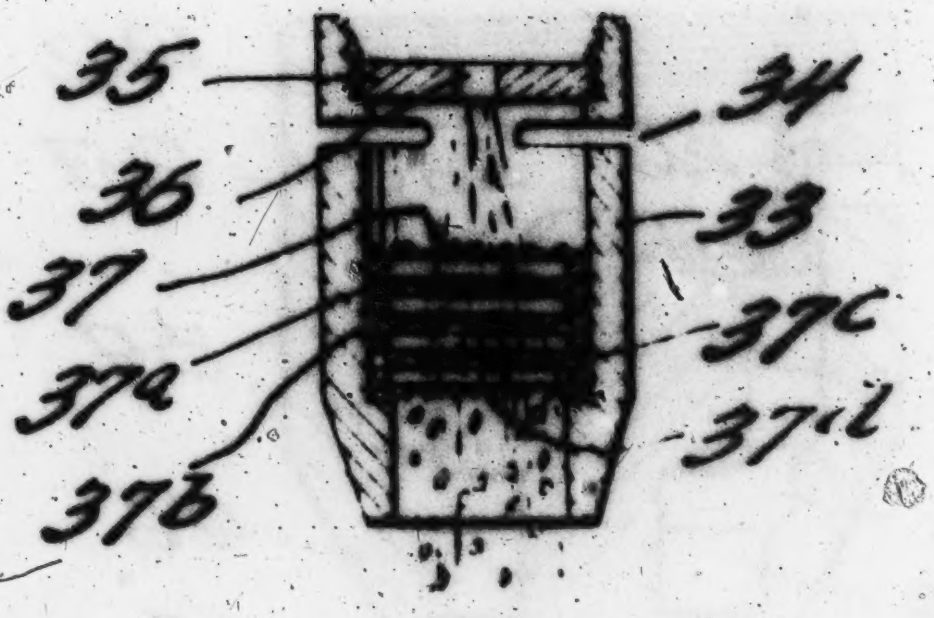
With best regards.

Yours faithfully,

Encls.

Elie Aghnides

Deft's Ex 34


35
34
36
33
37
37c
37a
37d
37b

Defendant's Exhibit 40

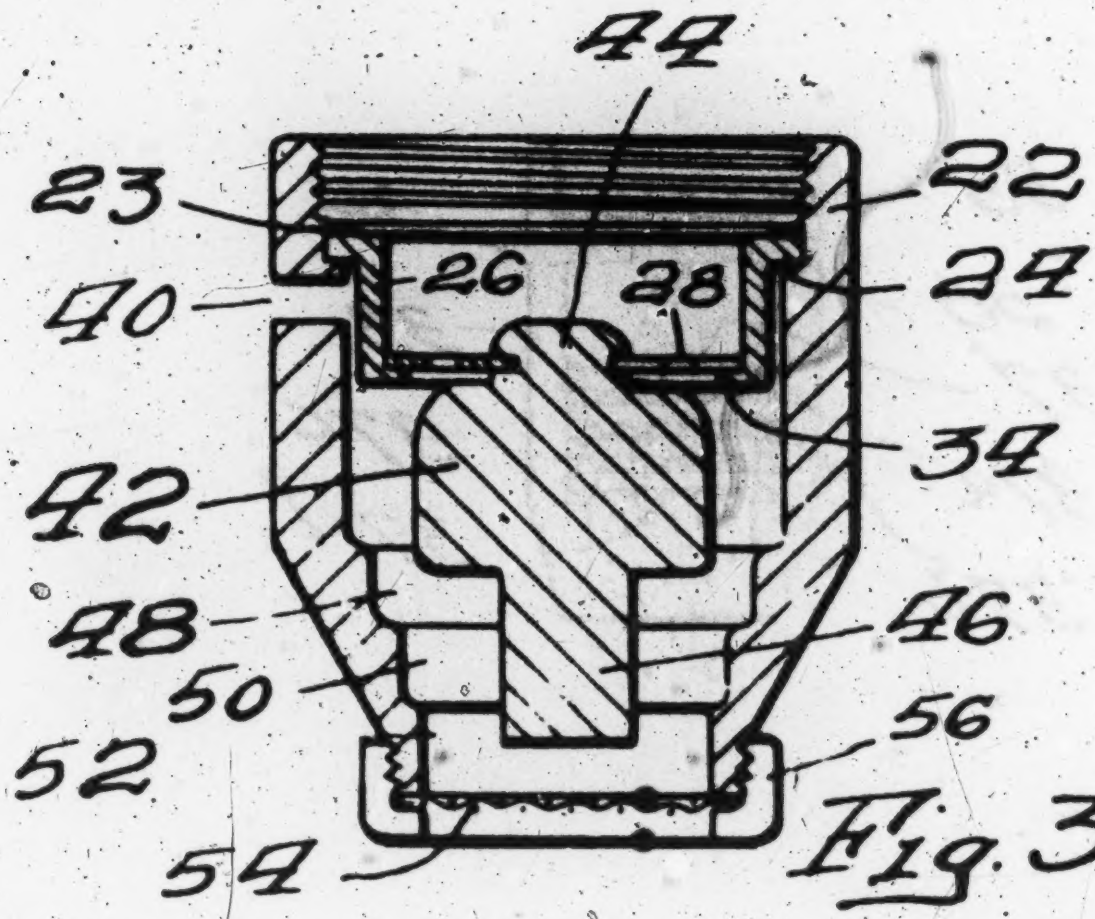


Fig. 3.

* * *

Authenticating Certificate of Consul of the United States of America of London England.

* * *

THE PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS,
LONDON, W.C.2,
ENGLAND.

I, the undersigned being an officer authorised in that behalf by the Board of Trade, hereby certify that the annexed (document 'A') are true copies of the complete specification and drawings, as placed open to public inspection on the 9th June, 1936, under the provisions of Section 91(4) of the Patents and Designs Acts, 1907 to 1932, in connection with the application for Patent of Elie Aghnides No. 33,884 of 1935, made on the 6th December, 1935, under the provisions of Section 91 of the said Acts.

I also certify that in pursuance of a request made under Section 79(2) of the Patents Act, 1949, the information given on the annexed document, marked 'B' regarding the specifications cited as the result of a search made under Sections 7 and 8 of the said Act, 1949, in connection with Patent No. 468,687 was furnished; and that such information is a true transcript from the report made by the Examiner.

Witness my hand this 3rd day of November 1955.

(Signature)

Seal

* * *

2 App. 144 Plaintiff's Exhibit 16

AO Form 120

In Re Patents

United States District Court

for the

S. D. N. Y.

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SOLICITOR

SIR:

SEP 21 1954

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 16th. day of September U. S. PATENT OFFICE, 19 54, in this court an action, suit, or proceeding No. Civ. 95-355, entitled:

Name Melard Manufacturing Corporation, Plaintiff,

Address New York

versus

Name Elie P. Aghnides, Defendant,

Address New York

B

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	Aug. 6, 1940	Aghnides
2	2,316,832	Apr. 20, 1943	Aghnides
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

WILLIAM V. CONNELL, Clerk

Date Sep. 20, 19 54. By ....., Deputy Clerk

182584

Form 789

UNITED STATES DISTRICT COURT
District of Northern Illinois - Eastern Division

DISTRICT OF NORTHERN ILLINOIS - EASTERN DIVISION

[illegible]TOR

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

DEC 31 1954

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 19th day of July, 19[illegible]50 in this court an action, suit, or proceeding No. 50 C 1022, entitled:

Name ELIE P. AGHNIDES, Plaintiff,

Address 46 West 54th Street, New York 19, N.Y.

versus

Name CHLONY W. HOLDEN and MARGUERITE HOLDEN, a corp., d/b/a KNICKERBOCKER RUBBER COMPANY, Defendant,

Address 6101 S. May Street, Chicago 21, Illinois

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,896	August 6, 1940	Elie P. Aghnides
2			
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

[illegible] final judgment entered in favor of defts and against plff

[illegible] issue invalid and dismissing complaint - DRAFT - Judge Knoch

IN WITNESS WHEREOF I have affixed my hand this 29th day of [illegible]ecember, 193[illegible]54, at Chicago, Illinois.

[illegible]
Clerk of said Court.

187884

Plaintiff's Exhibit 16

AO Form 120

In Re Patents

United States District Court

for the

NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 18th day of JANUARY, 1955, in this court an action, suit, or proceeding No. 55C 84, entitled:

Name MELARD MANUFACTURING CORPORATION, Plaintiff,

Address 432 Austin Place, New York

versus

Name CHASE BRASS & COPPER CO., INC., Defendant,

Address Waterbury Connecticut and doing business in Chicago, Illinois

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,816	August 6, 1940	Elie P. Aghnides
2	2,316,832	April 20, 1943	Elie P. Aghnides
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

Date January 18, 1955

By R. Sommers, Clerk
Deputy Clerk

18204

421

1937

CONTENTS:

	Application ..... papers.	JAN 5 1938
2.		Dec 21-1937
3.		Dec. -1937
4.		MAR 21 1938
5.		Dec 15-1938
6.		JUN 23 1938
7.		[illegible]
8.		[illegible]
9.		MAY 11 1939
10.		MAY 1
11.		JUL 14 1939
12.		[illegible]
13.		[illegible]
14.		[illegible]
15.		(Expire Sept)
16.		[illegible]
17.		JAN 13 1940
18.	Notice of Acceptance & Letter	JAN 18 1940
19.		[illegible]
20.		JAN
21.	EXAMINER'S STATEMENT	
22.	Hearing	June 3-1940
23.	Brief	June 3, 1940
24.	BRIEF	JUN - 1940
25.	DECISION BY BOARD	JUN 18 1940

26.		June 3 - 1940
27.		[illegible]
28.		[illegible]
29.		[illegible]
30.		[illegible]
31.	Notice of Suit	July 26-1950
32.	Notice of Suit	Sept 19-1950
33.	Notice of Suit	Mar 4-1953
34.	Notice of Suit	June 5-1953
35.	Notice of Suit	May 27-1953
36.	Notice of Suit	Apr. 19, 1954
37.	Notice of Suit	Aug. 5-1954
38.	Notice of Suit	Sept. 21-1954
39.	Notice of Suit	Dec. 31-1954
40.	Notice of Suit	Jan. 19-1955
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		

Plaintiff's Exhibit 17 2 App. 147

PATENTED FILE
RETURN TO RECORD ROOM

NUMBER (Series of 1935)

328120

DIV. 3432

1940

PATENT No. 2316832

DATED APR 20 1943

(EX'R'S BOOK)

Name ELIE P. AGHNIDES

of NEW YORK,

State of ~~NEW YORK~~

Invention FLUID MIXING DEVICES

ORIGINAL

APPLICATION FILED COMPLETE APR 5, 1940

PARTS OF APPLICATION FILED

Petition, Specification, Oath, First Fee $30 — APR 5, 1940

1 sheets Drawings,

Examined and passed for Issue Dec 23, 1942

Notice of Allowance

Final Fee

Attorney JOHN BOYLE, JR 801 WASHINGTON LOAN & TRUST BLDG CITY.

Associate Attorney

No. of Claims Allowed 2 Print Claim

Title as allowed Fluid [illegible]

Division of App., No.

BELGIUM DEC 4 1934

APPLICATION FOR U. S. LETTERS PATENT
ALL RIGHTS RESERVED

Law Reporter Blank No. 601
518 FIFTH ST. N.W., WASHINGTON, D. C.

PETITION

328120

To the Commissioner of Patents:

Your petitioner (1) Elie F. Aghnides

citizen of the Greek Republic residing at New York City in the County of New York and State of New York and whose post-office address is 609 West 158th St., New York City

prays that Letters Patent may be granted to him for the improvement in Fluid Mixing Devices

set forth in the annexed Specification.

And he hereby appoints (2) John Boyle Jr.

U.S. PAT
APR 1
DIVIS

of 801 Washington Loan & Trust Bldg Wash. D.C.

Register No. 11,231 his Attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign his name to the drawings, to receive the Letters Patent, and to transact all business in the United States Patent Office connected therewith.

Signed at State of N.Y., in the County of New York and State of this 1st day of [illegible], 19[illegible]

(SIGN here FIRST name in FULL.) [signature]

(1) In case of assignment of the invention, application and oath must be made by actual inventor, even if patent issue to assignee.
(2) If the power of attorney be given to a firm, the full name of each member of firm must be given, or it will be ignored.

SPECIFICATION

To All Whom It May Concern:

BE IT KNOWN, That Elie F. Aghnides

citizen of the Greek Republic residing at New York City in the County of New York and State of New York has invented certain new and useful improvements in Fluid Mixing Devices

328120

of which the following is a specification:

APR - 1 AU 146. 01 BR

My invention relates to a device for intimately mixing a large volume of a gas, such as air, with a liquid such as water, and ordinarily is used for producing a jet of water containing air bubbles disseminated throughout the jet. Such a jet is whitish in appearance, soft and light to the touch and posesses numerous advantages not found in the ordinary water jet as discharged from a faucet. ~~For instance, when a full glass of water~~ is drawn from my device, myriads of bubbles escape leaving only half of the glass full, thus proving the large amount of air that was intimately mixed with the water. If one's hand is put in the path of the bubbly jet, the jet will flow evenly and uniformly over the surface and will wet the entire surface without splashing. Moreover, to the touch, the jet is caressingly soft and light, due to the presence of the bubbles which lessen the density of the jet.

If such an aerated jet is permitted to flow into a soap solution, it will make an extraordinarily large amount of foam, which will be found to be very useful generally for washing. When used for shampoo sprays and bath showers, the jet has a relaxing effect, in the same way as carbonated bubble baths. The action of the bubbly jet upon a soap solution should not be confused with the property of a jet flowing at high velocity - whether aerated or not by an injector-, which can force a certain amount of air into the solution and produce a certain amount of lather. Such lather is formed by large bubbles which dissipate rapidly and in addition, the jet splashes the water. On the other hand, the jet from my device is splashless and the lather formed is uniform, creamy, abundant and lasting.

After the air bubbles escape from a jet of water drawn through my device it has been demonstrated by chemical analysis that there is an increase in the dissolved oxygen content of the

water which reduces some of the objectionable taste and smell of the water.

It has been proposed heretofore to entrain a gas by the flow of a liquid under pressure and to mix the two fluids by means of obstructions in the path of the liquid. It has also been proposed to place a fine foraminous screen in the path of an unbroken forceful stream of liquid, for atomizing said liquid as it passes through the screen into the atmosphere but without any mixing of liquid and air being effected in the device.

In my device however, I finely break up the liquid and mix it with air before discharge and imprison in the mass of the liquid, small air particles, forming a coherent jet on discharge, with the air particles disseminated throughout the jet. I have discovered that with a certain degree of division of the fluid mixture, the air particles will remain in the flowing jet. I have also discovered that if the air has not been sufficiently divided and imprisoned in the mass of the liquid, it separates immediately at the discharge end of the device with no substantial amount in the flowing jet. On the other hand, if the air particles are too tiny, they will remain in the water after the flow, to disappear gradually, exactly the same way as when the water is cloudy due to trapped air. I have discovered that when the division is pushed too far, aeration is not so thorough, less air being mixed with the water and the advantages of my bubbly jet are lost. Accordingly, my device is designed to produce a jet with bubbles sufficiently small to remain in the jet, after discharge from the device but still large enough for breaking and escaping during the flow of the jet. This result cannot be obtained unless a minimum degree of division of the water is effec -

ted, either by an upstream foraminous diaphragm and a downstream screen together with the proper stream velocity, or similarly a downstream screen, an inlet orifice and an apertured diaphragm between.

Generally speaking, my invention consists of a device comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube, such as an ordinary household water faucet, containing water under the normal main pressure of about 3 atmospheres. The outlet end of the device is adapted to discharge a coherent jet containing air bubbles disseminated throughout the jet. At the upstream end of the chamber is an apertured diaphragm through which the stream of water is adapted to be forced into the chamber with substantial velocity. An air port opening into the chamber is provided through which air is induced by the stream of water. At least one foraminous screen is provided in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end, for finely breaking up the stream of water which is throughly mixed with the air.

Means are provided for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet. This may be in part, a multiplicity of orifices in the upstream diaphragm ~~so as to deliver sufficient water to flood the screen;~~ or in the addition of at least a second foraminous screen between the first screen and the outlet end, with openings so close to each other that the issuing aerated water unites to form a coherent jet; or, in the addition of a tubular portion at the outlet end and adapted to contract the stream of aerated water issuing from the screen, to form a coherent jet.

Referring to the drawing ~~for a more complete disclosure of the invention.~~

Fig. 1 is a vertical section of one form of my invention. ~~attached to a water faucet.~~

Figs. 2 and 3 are similar sections of modified forms.

As shown in Fig. 1, my device is attached to an ordinary water faucet 1 and comprises a rubber tap connector portion 2, that grips tightly over the end of the faucet, water under pressure passing through the apertures 3 into the chamber 4 for forcing the connector into gripping position, all as more fully described in my U. S. patent No. 2071,780. In the upstream end is a metal diaphragm 5 that is provided with a plurality of orifices 6 uniformly distributed throughout the area of the diaphragm. At the downstream end is a perforated plate screen 7 and below it is the contracted outlet 8 to unite the stream, it also renders ~~to render~~ the contour of the jet cylindrical and the flow uniform. For inducing air into the chamber 9 between the diaphragm 6 and the screen 7 are a plurality of air inlet openings 10.

In Fig. 2, my device is secured to the end of the faucet by a screw coupling 11 and the apertured diaphragm 5 is clamped between the end of the faucet 12 and the lower portion 13. Instead however of having only one downstream screen as in Fig. 1, I provide two spaced screens 14 and 15 for dividing and mixing the air and water and which will cause the air bubbles in the water to be somewhat smaller than where only a single screen is employed. Air inlets 16 suitable in number are provided in the walls of the portion 13.

In Fig. 3, I employ the same type of rubber tap connector 2 as in Fig. 1, except that I provide a constricted orifice 17, above the upstream apertured diaphragm 18, and the air inlets 19 terminate close to the surface of the downstream screen 20.

In Fig. 4, I employ a screw coupling 21 having a restricted orifice 22 for connecting my device to a faucet and I employ two spaced apertured diaphragms 23, 24 located above the air inlets 25 and I use three spaced screens 26, 27, 28, in the downstream end of the device.

Plaintiff's Exhibit 17

In Fig. 5, I use a single upstream apertured diaphragm 29 and three contacting superposed screens 39 in the downstream end of my device. The device is screw connected to the end of a faucet and the diaphragm 29 is clamped therein. Air apertures 40 are provided in the wall of the device.

In Fig. 3, I employ the same general type of rubber tap connector 30 as in Fig. 1 ~~and 3~~. The metal coupling 31 having a restricted orifice 32 is secured thereto. Screwed to the coupling is the lower portion 33, provided with air inlets 34, an upstream diaphragm 35 having a single orifice 36 and five spaced wire screens 37, 37a, 37b, 37c, and 37d. The purpose of the multiplicity of screens is to compensate for the decrease in the division of the water through the single orifice 36 as compared with a multiplicity of orifices, as in the other embodiments. When a single orifice is used in the upstream diaphragm, the ~~the~~ number of screens used depends on the ~~size of the~~ orifice area, the distance between the diaphragm and screens and the mesh of the wire screens.

The essential features of my invention, as embodied in the various modified forms shown in the drawing comprise an upstream apertured diaphragm adapted to deliver a stream of water with substantial velocity and a down stream screen in the path of the stream of water, which finely breaks up the stream and mixes it with air before discharge. The screen offers only a small resistance to the flow of the stream therethrough i.e. the required minimum resistance necessary for the proper functioning of the device. If only one screen ~~having the minimum resistance~~ is used instead of a plurality of such screens, then the number of holes in the diaphragm or the distance between the diaphragm and the screen must be increased. ~~By so doing, the stream will impinge on the screen with less force and flood it. In order to accomplish the desired end, there must be a sufficient volume of water~~

~~at such a velocity issuing from the upstream diaphragm to spread over and flood the downstream screen.~~

The preferred embodiment of my invention for accomplishing this end comprises a device in which there are a multiplicity of orifices spread over the upstream diaphragm and a plurality of superposed wire mesh screens downstream, said screens preferably separated from each other by an interspace. Unless there is a certain degree of division of the water, the desired results cannot be obtained. In the preferred embodiment, the optimum divisionis obtained for rendering the jet as light as possible to the touch, which means a large proportion of air imprisoned in the mass of the jet in the form of air bubbles.

A non-limitative example is a device in which the upstream diaphragm, 0.8-1 mm. thick and 22mm in diameter, has thirty-two uniformly spaced holes, 0.8mm in diameter each, and 6mm downstream from said diaphragm are three superposed wire mesh screens 20mm in diameter, with an interspace between the screens of 1mm. The screens have 15 wires per linear centimeter, each wire being 0.23mm in diameter. Air ports open into the chamber between the diaphragm and the downstream screens. ~~The aerated water issuing from the last wire mesh screen unites to form a coherent jet, the~~ The outlet end is contracted to 17mm diameter. Such a construction provides the optimum screen resistance, good contact between the air and water in the chamber and the pressure of the water is more evenly distributed across the outlet end, which means a softer and more uniform flow of the bubbly jet.

The best results are obtained by the use of finely foraminous discharge screens in which the holes are very close together and the plane parts between the holes are very reduced. ~~In other words, the resistance offered by such foraminous screens must on the one hand be sufficient to break the velocity of the stream of~~

328124

~~ter, flood the screen and cause the fluids to divide and mix.~~ On the other hand, the resistance offered by said screen or screens must be as low as possible because with the increase of resistance the amount of the air passing through the device decreases.

In the above example, if more than three screens of the type described were used, the jet would contain bubbles of smaller size, the total amount of air contained in the jet would become much less and the color of the jet would be less whitish. On the contrary, if a screen was removed or if three screens having less than 15 meshes per linear centimeter were used, the bubbles contained in the jet would become larger. As the distance from the outlet increases, the number of bubbles contained in the cross sectional area of the stream decreases.

I have found that when the water is discharged through a restricted orifice, as at 17, Fig. 1, at 22 Fig. 3, and at 32 Fig. 5 that the flow through the orifices in the upstream diaphragm is improved and a more regular and softer jet is delivered from the outlet end of the device.

A similar result is obtained when instead of the restricted orifice upstream of the diaphragm, a second foraminous diaphragm as 23, Fig. 4, preferably with greater aggregate cross section of the foramina, is located upstream of the first diaphragm 24, at a distance of about 1mm. Both the restricted orifice and the second diaphragm can be used together for a more uniform flow of the bubbly jet.

When the water is turned on through my device, if the faucet is opened only slightly so that very little kinetic energy is developed in the water as it emerges from the apertured upstream diaphragm, the water will discharge from the downstream screen in a perfectly normal manner and without air bubbles. However, as the faucet is opened further and the velocity increases, the water emerging from the orifices in the upstream diaphragm will draw air in through the air-ports, and this water striking the discharge screens will be finely broken up, and mixed with air ~~and flood the~~

screen. When the water attains a certain velocity, the entrained air acquires the necessary speed to pass through the resistance offered by the screen and the water. The air is likewise divided by the screen and the two fluids thus broken up thoroughly mix and the air particles are imprisoned in the mass of liquid. With a water pressure of about one atmosphere, a fairly well aerated jet will be discharged in the above example. Very good results are obtained when the pressure attains or exceeds 2 atmospheres up to the main pressure. Having secured the aerated mixture, it is withdrawn from the chamber in the form of a coherent jet with small bubbles disseminated throughout the jet. This arises in part from the fact that the openings in the downstream screen are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet. The coherence of the jet arises from the fact that the zone of aspiration of each little stream cuts or is at least tangent with the suction zone of the adjacent stream.

This application is a continuation in part of my applications Ser. No. 182,884 filed Dec. 31, 1937, and Ser. No. 52,923 filed Dec. 4, 1935.

328120

4 Claims:

1. A device for producing a coherent jet of water containing fine air bubbles disseminated throughout the jet comprising an aerating and mixing chamber, the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber provided with a multiplicity of apertures to divide the water into streamlets having a substantial velocity, an air port opening into the chamber through which air is induced by the streams of water, a screen at the discharge end of the device to subdivide the stream, the size of the apertures in the screen relative to the velocity and volume of the stream offering sufficient resistance at a predetermined velocity of the stream to flood the screen and effect the mixing of the water with the air, the aerated water uniting before discharge at the outlet end to form a coherent jet having small bubbles disseminated throughout the jet, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape after discharge and during the flow of the jet.

2. A device for producing a coherent jet of water containing fine air bubbles disseminated throughout the jet and comprising an aerating and mixing chamber, the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge the said coherent jet, a screen at the discharge end of the device for subdividing the water, an apertured diaphragm between the inlet end of the device and the outlet screen that will effect division of the water and spread the stream over the face of the outlet screen to flood it, an air port opening into the chamber through which the air is induced by the stream of water, the size of the apertures in the screen offering

sufficient resistance at a predetermined velocity of the stream to flood the screen and effect mixing of the water and air, the aerated water uniting before discharge at the outlet end to form a coherent jet having small bubbles disseminated throughout the jet, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape after discharge and during the flow of the jet.

3. The device of claim 1 in which there is a foraminous member upstream the diaphragm.

4. The device of claim 1 in which there is a restricted orifice upstream the diaphragm.

5. The device of claim 1 in which there is a restricted orifice and foraminous member upstream the diaphragm.

6. The device of claim 1 in which there is a tubular channel between the outlet screen and the outlet end adapted to contract the stream before its discharge.

7. The device of claim 1 in which there is a plurality of superposed screens at the discharge end of the device.

8. The device of claim 1 in which there is a plurality of superposed upstream diaphragms.

9. A device for producing a coherent jet of water containing fine air bubbles disseminated throughout the jet comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge said coherent jet, an apertured diaphragm at the upstream end of the chamber through which the stream of water is adpted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, andmeans in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the bubbles being of a size that will be retained in the flowing jet on dis-

charge but will escape after discharge and during the flow of the jet.

10. A device for producing a coherent jet of water containing air bubbles disseminated throughout the jet, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, an apertured diaphragm at the upstream end of the chamber through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and for offering sufficient resistance for throughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the apertured area of the diaphragm being proportioned to effect a division and mixing of the air with the water before their discharge from said outlet end, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape after discharge and during the flow of the jet.

11

In Witness whereof I affix my signature to the specification.

(2) Elie Aghnides

Elie G. Aghnides

State of New York :
: ss
County of New York:

Elie G. Aghnides being duly sworn, deposes and says that he is a citizen of the Greek Republic and a resident of New York City, N. Y.; that he verily believes himself to be the original, first and sole inventor of the Fluid Mixing Device described and claimed in the annexed specification which discloses and claims certain matters derived from earlier applications filed by him on December 4, 1935 Serial Number 52,923 and on December 31, 1937 Serial Number 182,884; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in the United States of America or any foreign country before his invention or discovery thereof; that he does not know and does not believe that the same, except as to matters disclosed in said applications Ser. No. 52,923 and Ser. No. 182,884 was patented or described in any printed publication in the United States of America, or any foreign country more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; or patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application and that no application for patent on said invention has been filed by him or his legal representatives or assigns in any country foreign to the United States, except as follows:

12 32[illegible]

Belgium Dec. 8, 1934 and in a number of other foreign countries the exact list of which is not now available to affiant, all of which applications were filed within one year subsequent to the date of the filing of the said Belgian application, but the information regarding specific dates thereof is not now available toaffiant.

Elie P. Aghnides

Sworn to and subscribed before me this 5th April 1940.

13

Plaintiff's Exhibit 17

328120

Fig. 1.

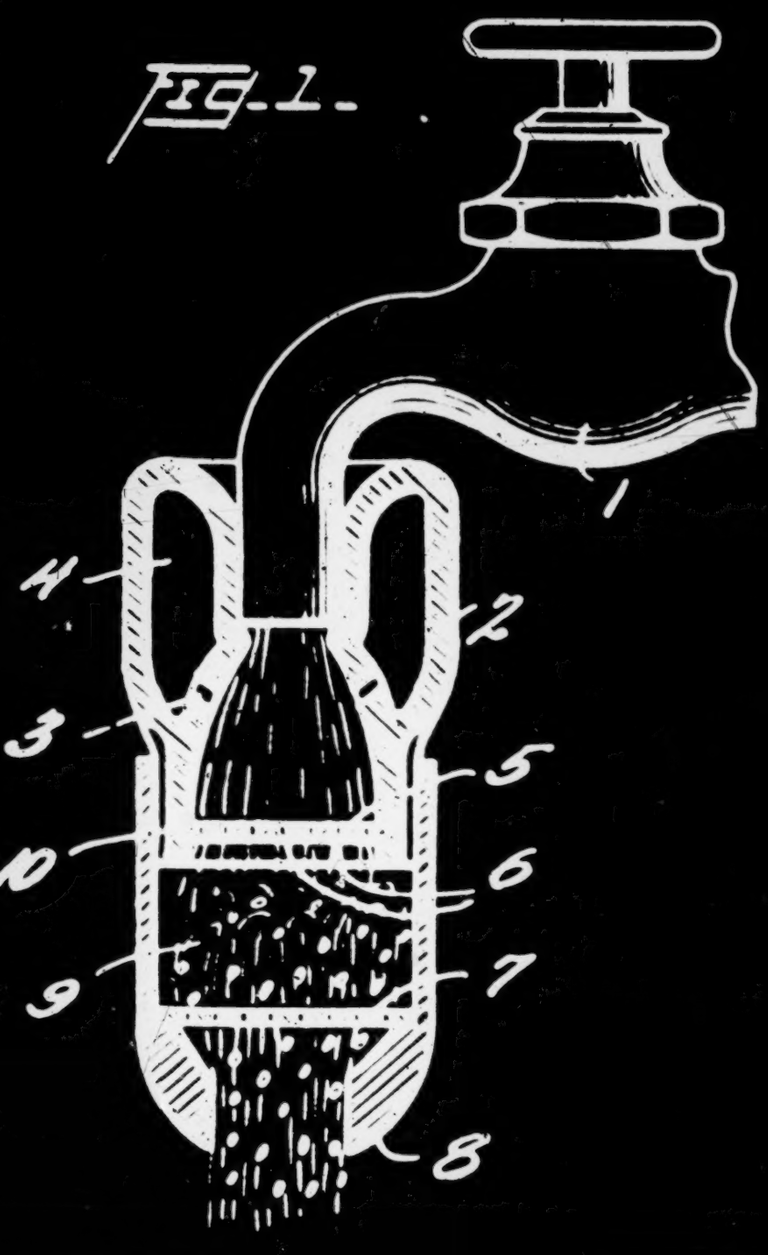


Fig. 2.

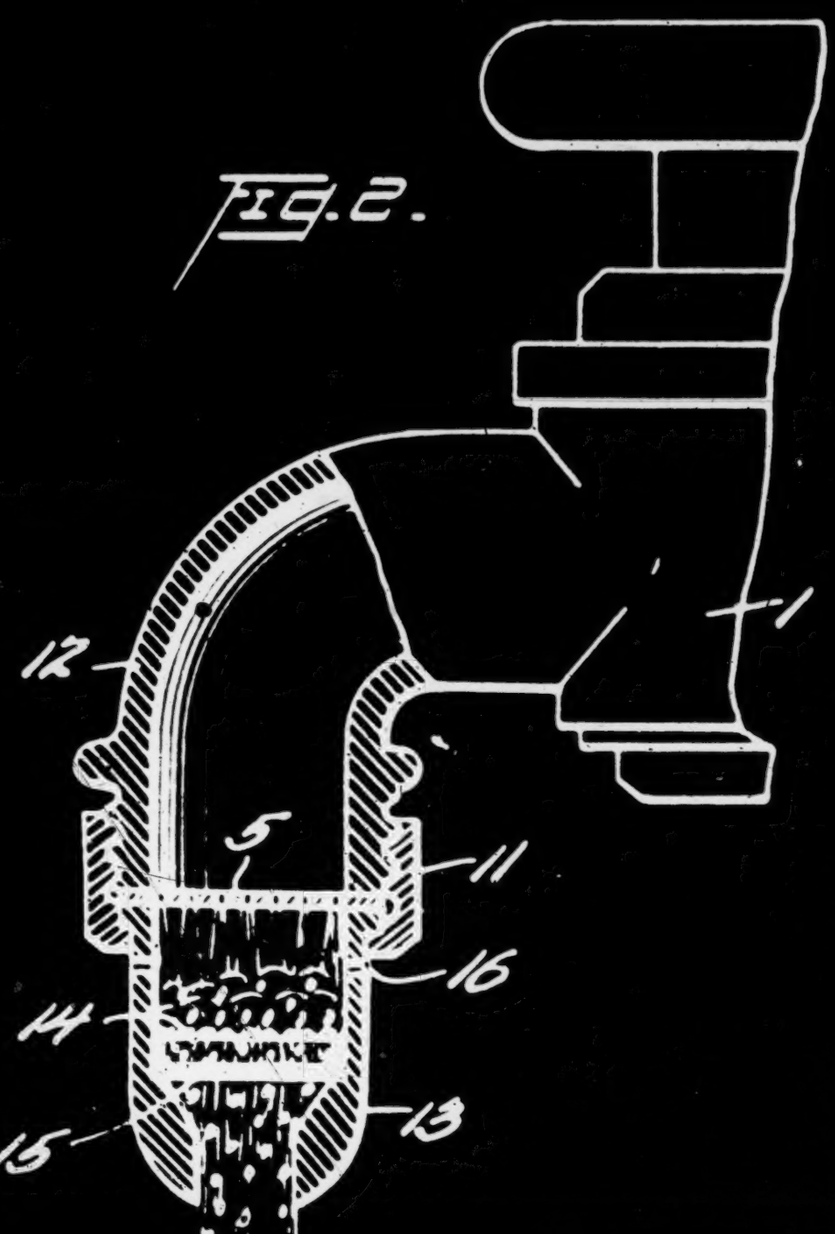


Fig. 3.

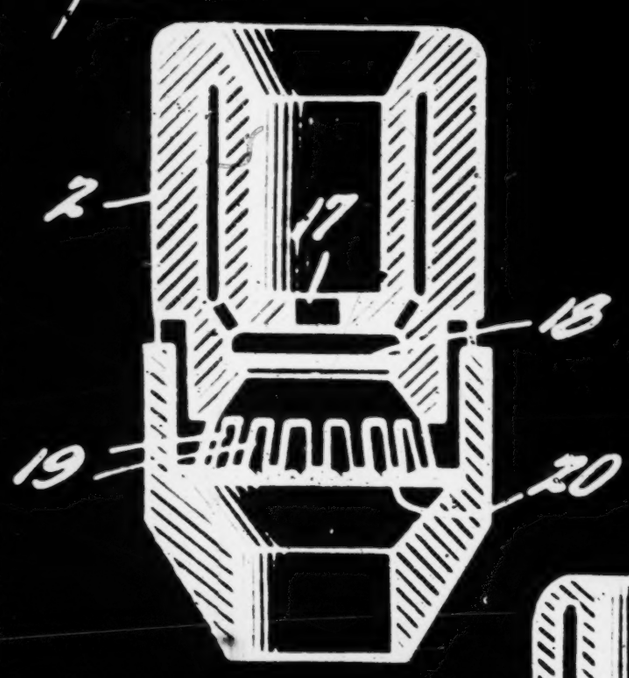


Fig. 4.

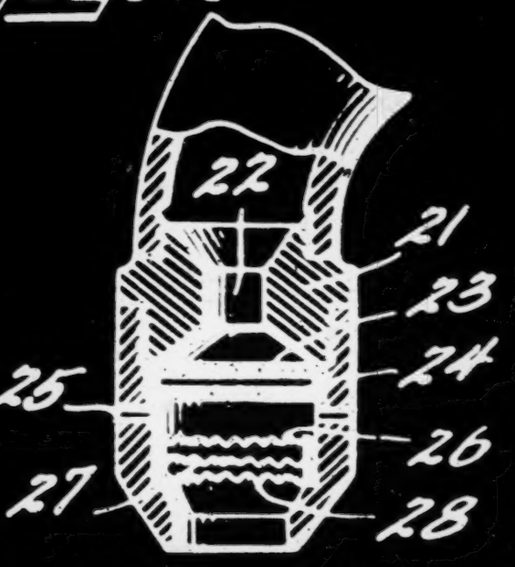


Fig. 5.

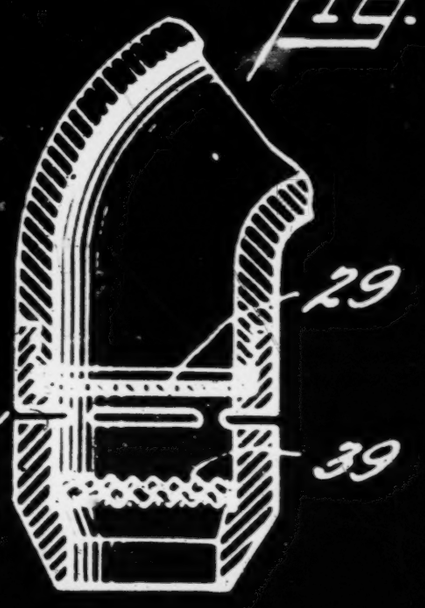
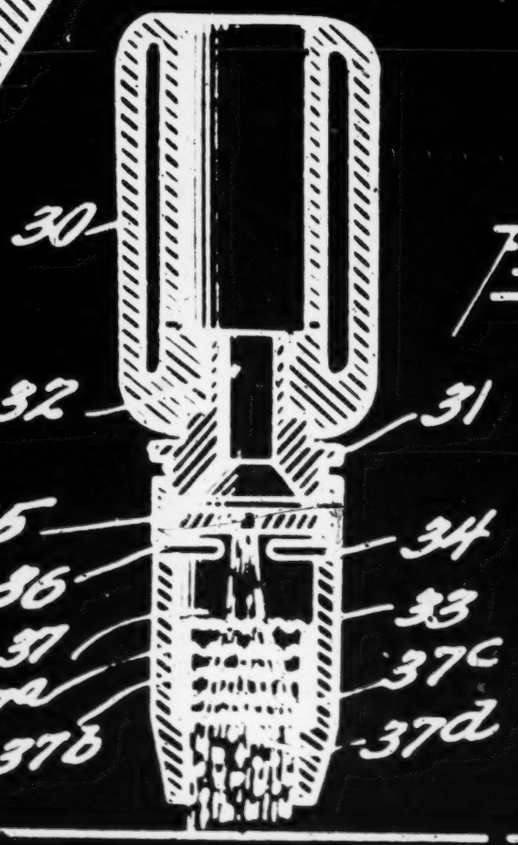


Fig. 6.



Inventor

Elie P. Aghnides

By

John Boyle Jr.

Attorney

17

328120

Plaintiff's Exhibit 17 2 App. 163

Div. 32 Room 4086 980

Paper No. 3

All communications respecting this application should give the serial number, date of filing, and name of the applicant

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

PRN:mk

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents.

... 11—8623

Applicant: Elie P. Aghnides

Ser. No. 328,120
Filed April 5, 1940
For FLUID MIXING DEVICES

John Boyle, Jr.
801 Washington Loan & Trust Bldg.
Washington, D. C.

MAILED MAY 15 1940

This application has been examined.

References relied upon:

Guild	25,566	Sept. 27, 1859	261-116
Friedrich	2,003,184	May 28, 1935	261-116
Felten et al (Br.)	6,012	of 1909	261-76
Haisman et al (Br.)	7,005	Mar. 22, 1913	299-141

(1 sheet drawing, 3 pages specification)

The name of the inventor is not uniform in the papers. The middle initial is "P" in some places and "F." in others.

Claims 1 to 10 are rejected on Haisman et al or Friedrich. In the former the diaphram 2 is provided with a plurality of apertures 3 discharging jets of water against a screen 6, an air port 10 permitting air to enter and mix with the water. While the patent contemplates forming a spray, the claims under consideration do not describe structure matterially different but rely upon statements of result to distinguish. In order to point out the difference, the limitations must involve structural differences, not the result. Friedrich shows in Fig. 2 equivalent means including a plurality of apertures 37 for forming a spray to entrain gas to form a fluid mixture in nature similar to that described by the claims. Baffles 161, Fig. 20, assist in forming this mixture. The various screens, etc. included by claims 7 and 8 are obvious means for intermixing the fluids or separating the liquid into a plurality of streams. The screen above the diaphram is present in Haisman et al. The plurality of outlet screens is shown by Felten et al.

Claims 1 to 10 are further rejected on the ground of

15

double prosecution of similar claims in different applications. The copending application 182,884 includes claims indistinguishable in scope from the claims under consideration. See ex parte Smith 1888 C. D. 131.

Claims 1 to 10 are rejected.

JAH.

Paul R. Neff
Acting Examiner.

16.

328120

IN THE UNITED STATES PATENT OFFICE

Applicant: Elie Aghnides
Serial No. 328,120
Filed April 5, 1940
For Fluid Mixing Devices.

U.S PATENT OFFICE
NOV 15 1940
DIVISION XXII.

Div. 32
Room 4086.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In response to the Office Action dated May 15, 1940:
Page 2, cancel all but the first two lines and substitute:

--In my patent 2,210,486 dated Aug. 6, 1940, I have disclosed several types of devices of the type just described and in which one or more superposed fine wire mesh screens having holes of about 0.6 sq. mm. are placed in the path of one or more streams flowing from the upstream diaphragm with substantial kinetic energy. Good results have been obtained using devices of the type described. Upon further experimentation, I have discovered certain improvements that make operation of the jet even more satisfactory. These improvements are based upon discovery of the fact that the degree of division of the fluid mixture determines to a certain extent, the length of time that the air will remain imprisoned in the liquid. I have discovered that with a certain degree of division of the fluid mixture, the air particles will remain in the flowing jet. On the other hand, if the air has not been sufficiently divided and imprisoned in the mass of liquid, it separates immediately at the discharge end of the device with no substantial amount in the flowing jet. I have also discovered that if the air particles are too tiny, they will remain in the water after the flow, to disappear gradually, the same way as when water is cloudy due to trapped air. I have discovered that when the division is pushed too far, aeration is not so thorough, less air being mixed with the water, and the air particles are too small to produce an appreciable effect of

effervescence during the flow or use of the jet. By specially proportioning the orifice area in the upstream diaphragm and the downstream dividing-mixing resistance, I have been able to produce a jet containing air particles of the described character. In such a device, the mixing is very intimate but the quantity of air contacted with the water is relatively small. While a device discharging a jet containing tiny air particles is useful for drawing beer to form a persistent froth on the top of the beer, when aeration of water is considered, the device must be proportioned to produce a jet having bubbles, rather than tiny air particles, the latter being devoid of buoyancy and forming an emulsion-like mixture instead of the desired bubbly jet with the spectacular effect upon a soap solution.

Accordingly, my device is designed to produce a jet with bubbles sufficiently small to remain in the jet, after discharge from the device but still large enough for breaking and escaping precipitately from the water collected at the discharge, as in a receptacle or otherwise after the disruption of the jet through impact on a surface. In the improvements about to be described, my device is so designed as to form a jet having in its mass, a large amount of air in the state of bubbles of such size, as to function in the manner just described. --

Page 3, cancel lines 1-4; line 5, after "consists" insert--therefore--; line 23, cancel beginning "so" through "screen" in line 24; line 30, cancel beginning "for" to the end of the sentence.

Page 4, line 11, cancel "to render" and substitute --to unite the stream. It also renders--.

Page 5, line 11, cancel beginning "The" through "diaphragm", line 14 and capitalize "the", line 15; line 16, cancel "size of the" and after "orifice" insert --area--; line 27, cancel "having the minimum resistance--; line 30, cancel the sentence beginning "By" through the

first two lines on page 6 and substitute -- By so doing the streamlets will impinge on the screen with less force which will correspond to an increase of the resistance of the screen and thus the latter will oppose to the streamlets the required minimum resistance.--

Page 6, line 20, cancel the sentence beginning "The" through "jet" line 21 and capitalize "the"; line 22, cancel "being" and substitute --is--; line 22 before the period insert -- to render the contour of the jet uniform--; line 23, after "resistance" insert --which means the right proportion between the holes in the diaphragm and the downstream dividing and mixing means; line 29, cancel beginning "In" to the end of the page and through "hand", page 7, line 2.

Page 7, line 2, before "the" insert -- In other words--; line 11, before "larger" insert -- and the pressure, throughout the cross-section of the bubbly jet, unevenly distributed.--; last line, before "mixed" insert --and--; cancel the last three words and the wond "screen" page 8, line 1.

Page 8, line 5, cancel the sentence beginning "with" through the period in line 7, and substitute -- In the above example the device is so proportioned that with a water pressure of about one atmosphere a fairly well aerated jet will be discharged.--; line 19, insert after "1937"-patented August 6, 1940, number 2,210,846.

Page 7, line 16, change "Fig. 5" to --Fig. 6--.

Please cancel the middle initial of applicant wherever it appears in the application.

Cancel all the claims and substitute the following:

11. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a fuacet or the like and the outlet end of which is adapted to discharge said jet, means at the

upstream end of the chamber to divide the water into streamlets having a substantial velocity, an air port opening into the chamber through which air is induced by the streamlets of water, and downstream means in the path of the water after it leaves the means at the upstream end of the chamber and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the jet.

12. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge said jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water and at least one foraminous screen in the path of the stream of water and after it leaves the orifice and before it discharges at the outlet end for finely breaking up the water and mixing it with the air to form a coherent jet having bubbles, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape precipitately from the sater after the disruption of the flowing jet.

13. A device for producing a jet of water containing air bubbles comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which the stream of water is adapted to be forced into the chamber with substantial

velocity, an air port opening into the chamber through which the air is induced by the stream of water, means in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air and for thereafter uniting the aerated water to form a coherent jet having bubbles of a size that will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the flowing jet.

14. A device for producing a jet of water containing air bubbles comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to dischage the jet, an apertured diaphragm at the upstream end of the chamber through which the stream of water is adapted to be forced ihto the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means in the path of the stream of water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water to form a coherent jet having bubbles, the resistance offered by the said means and the apertured area of the diaphragm being proportioned to effect the entrainment and mixing of the air with the water before their discharge from said outlet end, the bubbles being of a size that will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the flowing jet.

C 670

15. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

16. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice upstream the apertured diaphragm.

17. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured

diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice and foraminous member upstream the apertured diaphragm.

18. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, superposed apertured diaphragms at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragms and means in the path of the stream of water after it leaves the apertured diaphragms and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles.

Remarks.

The rejected claims have all been cancelled and rewritten in view of applicant's prior patent 2,210,846. The claims of this patent were allowed by the Board of Appeals over the same references as are relied upon here. For that reason it is believed that no further discussion of these references and the construction put upon them is believed necessary. The sole question now presented

is one of distinguishing over applicant's prior patent. The revision of page 2 of the specification points out the improvement that has been made and claims 11-14 are directed to this improvement. The remaining claims are directed to certain structural features and which are not disclosed in the prior patent. Since the new claims are distinguishable in scope from the prior patent the rejection on the ground of double patenting is not tenable. The decision relied upon by the Examiner was overruled in Feister 1890 C. D. 167 and Cahill 1893 C. D. 78. Reconsideration and allowance is requested.

Respectfully submitted,

By John Boyd
Attorney.

November 14, 1940.

2 App. 172 Plaintiff's Exhibit 17

Div. 32 Room 4086

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

Paper No. 5

All communications respecting this application should give the serial number, date of filing, and name of the applicant

PRN:TIS

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents.

11—8028

John Boyle, Jr.
801 Washington Loan & Trust Bldg.
Washington, D. C.

Applicant: Elie Aghnides

Ser. No. 328,120
Filed Apr. 5, 1940
For FLUID MIXING DEVICES

NOV 27 1940

Responsive to amendment filed Nov. 14, 1940.

Added art:

Aghnides	2,210,846	Aug. 6, 1940	261/76

Claims 11 to 18 are rejected on the ground of double patenting in view of the patent to Aghnides who shows and claims the same structure having the same mode of operation as the device of the claims. In page 2 applicant has attempted to distinguish between the results provided by the patented device and those produced by the matter of this application. While there may be a difference in degree of fineness of the air bubbles in the water such difference cannot distinguish the present claims wherein the structure set forth is the same. In order to support a second patent structure patentably distinct from that shown and claimed must be set forth.

Claims 1 to 10 are canceled.

Claims 11 to 18 are rejected.

Examiner.

25

U.S. PATENT OFFICE
MAY 27 1941
DIVISION XXXII

U.S. PATENT APPLICATION DIV.
MAY 26 '41

TO THE UNITED STATES PATENT OFFICE

Applicant: Elie Aghnides
Ser. No. 328,120
Filed April 5, 1940
For Fluid Mixing Devices

Div. 32
Room 4086

Honorable Commissioner of Patents:

Sir:

In response to the Office Action dated November 27,1941, please amend as follows:

Cancel claims 11, 12, 13 and 14 and substitute the following:

~~14~~. A device for producing a jet of water containing air bubbles comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the jet, an orifice at the upstream end of the chamber through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the streams of water, and means in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up and for mixing the fluids to form a coherent jet having bubbles, the resistance offered by the said means and the cross-sectional area of the orifice being proportioned to produce bubbles of a size that will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the flowing jet.

REMARKS

Reconsideration of the rejection on the ground of double patenting is requested. The Examiner says that the Aghnides patent shows and claims the same structure having the same mode of operation as the device of the claims but this is not so. The patent discloses a device for producing a bubbly jet but does not show a device for producing the particular bubbly jet that is claimed. while he described in his patent 2210,486 how a bubbly jet can be obtained by placing in the path of one or more streams flowing from the upstream diaphragm with substantial kinetic energy, one or more superposed fine wire mesh screens having holes of about 0.6 sq. mm., he did not disclose at that time that when resistance by the screen attains a certain degree, bubbles having different characteristics can be obtained, these bubbles also being small enough to be retained in the jet.

We commend to the Examiner a careful reading of the amendatory matter on pages 1 and 2 of the last amendment. Having made the discovery that he did, that the length of time that the air bubble remained in the jet depended on the degree of division of the fluid mixture, he secured the desired division to produce the desired jet by proportioning the resistance offered by the screen to the apertured area of the diaphragm. This was not taught in the first patent and therefore claim 14 defines a specific type of bubbles which is, of course, comprised in the complete range of bubbles small enough to be retained in the jet, as covered by his patent.

The Examiner takes the position that while there is a difference in degree of fineness of the air bubbles that the claims set forth the same structure as disclosed in the patent. But mere contour of parts does not define structure. Proportions of parts to produce a different result is just as much structure as contour. In Eibel Co. v. Paper Co. 261 U. S. all that the patentee did was to change the angle of the paper making wire so that the paper went through the machine at a higher speed and thus produced a more uniform sheet of paper. That change produced a different structure of machine because it produced a different result. Yet if the Examiner is right here then the Supreme Court is wrong. In Hobbs v. Beach 180 U. S. 383, the Court said "the invention consisting rather in the idea that such change could be made, than in making the necessary alterations".

As to claim 15, which specifies "a foraminous member upstream the apertured diaphragm"; claim 16 which specifies " a restricted orifice upstream the apertured diaphragm"; claim 17 which specifies " a restricted orifice and foraminous member upstream"; and claim 18 which specifies "superposed diaphragms at the upstream end", these species are neither shown, described or claimed in applicants prior patent. The purpose of these constructions is explained in the specification at page 7.

Respectfully submitted,

Elie Aghnides,

By John Boyle
His Attorney

May 23, 1941.

28 3[illegible]120

Plaintiff's Exhibit 17

Div. 32 ROOM 4086 200

Address only "The Commissioner of Patents, Washington, D. C.," and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

Paper No. 7

All communications respecting this application should give the serial number, date of filing, and name of the applicant

PRN:TIS

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents.

SPO 11—8623

John Boyle, Jr.
801 Wash. Loan & Trust Bldg.
Washington, D. C.

Applicant: Elie Aghnides

Ser. No. 328,120
Filed Apr. 5, 1940
For FLUID MIXING DEVICES

MAILED
JUL 26 1941

Responsive to amendment filed May 26, 1941.

Claims 15 to 19 are rejected on the ground of double patenting in view of the Aghnides patent. The language of claims 15 to 18 points out no material difference over the structure shown and claimed by the patent. The orifice 17 of Fig. 3 in this application is anticipated by analogous elements in Figs. 2, 4 and 5 of the patent. Broadly construed the restricted orifice is indistinguishable from the passage through the faucet which is inherently restricted. Claim 19 attempts to distinguish by language relating to the product. It is not apparent that this requires any change in form or proportions but if so such changes do not constitute patentable subject matter. It is well known that the rate of movement through liquid depends upon the size of bubble and the patent covers apparatus for forming the same product however expressed.

Claims 1 to 14 are canceled.

Claims 15 to 19 are finally rejected.

THIS IS A FINAL REJECTION AND CLOSES THE PROSECUTION OF THE CASE BEFORE THE PRIMARY EXAMINER. ANY AMENDMENT OR REQUEST FOR RECONSIDERATION WHICH ON INSPECTION IS FOUND TO REQUIRE REEXAMINATION OF THE CASE WILL NOT BE ENTERED, BUT, IF PROMPTLY FILED, MAY BE GIVEN CONSIDERATION A REASONABLE TIME PRIOR TO THE EXPIRATION OF THE STATUTORY PERIOD. (SEE EX PARTE PETERSON 1928 C. D. 31.)

29 Jul 328120

Examiner.

2 App. 177

Plaintiff's Exhibit 17

41833

MAIL DIVISION
JAN - 6 1942
U.S. PATENT OFFICE

U. S. PATENT OFFICE
JAN 12 1942
DIVISION XXXII.

JAN--6-42 106879 Check -- 15.00

IN THE UNITED STATES PATENT OFFICE

APPEAL TO BOARD OF APPEALS

Applicant: Elie Aghnides
Ser. No. 328,120
Filed April 5, 1940
For Fluid Mixing Devices

Div. 32
Room 4086

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

I hereby appeal to the Board of Appeals from the decision of the Principal Examiner in the matter of the above entitled application which was finally rejected July 26, 1941:

The following are the points of the decision on which appeal is taken:

The Examiner erred in finally rejecting claims 15 to 19 on the reference and for the reasons of record.

Check for $15 covering the appeal fee is enclosed herewith.

An oral hearing is requested.

Respectfully submitted,

Elie Aghnides,

By John Boyd
His Attorney

January 5, 1942

BOARD OF APPEALS
JAN 7 1942
U. S. PATENT OFFICE

328120

2 App. 178 Plaintiff's Exhibit 17

Div. 32 Room 4086 PRN:TIS Paper No. 9

UNITED STATES PATENT OFFICE

WASHINGTON, D. C.

JAN 30 1942

In re application of Elie Aghnides Ser. No. 328,120 Filed Apr. 5, 1940 For: FLUID MIXING DEVICES	BEFORE THE BOARD OF APPEALS

EXAMINER'S STATEMENT

This is an appeal from the final rejection of claims 15 to 19 on the ground of double patenting in view of the copending patent: /Aghnides, 2,210,846, Aug. 6, 1940/

The rejected claims are:

15. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

16. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice upstream the apertured diaphragm.

17. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, and apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber

through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice and foraminous member upstream the apertured diaphragm.

18. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, superposed apertured diaphragms at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragms and means in the path of the stream of water after it leaves the apertured diaphragms and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles.

19. A device for producing a jet of water containing air bubbles comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the jet, an orifice at the upstream end of the chamber through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the streams of water, and means in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up and for mixing the fluids to form a coherent jet having bubbles, the resistance offered by the said means and the cross-sectional area of the orifice being proportioned to produce bubbles of a size that will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the flowing jet.

The alleged invention relates to an attachment to ordinary water faucets for mixing finely divided air bubbles through the water whereby the jet produced is soft and does not splash. As illustrated by the drawing six species are shown of which those comprising Figs. 1 and 2 are apparently identical with Figs. 1 and 4 respectfully in applicant's patent. These species have in common means to attach the device to one or the other of two types of faucets. As shown by Fig. 1 of this application the water is first forced through a perforated plate 5 into a chamber 9 having air inlets 10 and the mixture formed

is forced through perforated plate 7. Fig. 2 shows substantially the same device except for the provision of a plurality of screens 14, 15. Fig. 5 shows another specie similar to that of Fig. 2 in the patent having perforated plate 29 and screens 39 and no substantial departure from the device in Fig. 2. These three species are believed to have identical characteristics with those comprising bags 1, 2 and 4 of the patent but Fig. 1 is described as "one formof my invention" and Figs. 2 to 6 of modified forms. In other words applicant does not draw any line between species common to both cases and others which may appear to differ slightly therefrom.

In the species depicted by Figs. 3, 4 and 6 of this application similar perforated plates are followed by air mixing chambers and one or more screens. The water is however initially forced through a restricted orifice 17, 22 and 32 respectfully whereby applicant states that the flow is improved and a softer jet delivered.

Applicant states that when the faucet water is turned slightly on the water contains no bubbles but when the velocity through the perforated plates is increased the water will draw air through the air ports and this water striking the screens will be broken up mixed with the air. It is not pointed out that the initial jet as 17 in Fig. 3 for example has any specific effect on the water stream.

The patent to Aghnides has, as pointed out above, substantially the same disclosure and provides the same soft jet of water. Figs. 1, 2 and 4 include the same air and water mixing elements as Figs. 1, 5 and 2 respectively of this application. These elements are covered by the claims as for example claim 1 with the addition of claim 4.

33

Claim 15 recites a device, such as in Fig. 3, comprising a chamber 2 adapted for connection with the outlet of a faucet an apertured diaphram 18, an air port 19, opening into the chamber and means 20 in the path of the water for breaking up the water and mixing it with the air and a foraminous member (17) upstream the diaphram.

This claim does not patentably differ from claim 1 of the patent which in lines 56, 57 recites the chamber, in lines 61, 64 it recites the diaphram with an orifice, an air port is recited in lines 64, 65 and in lines 66 to 73 the screens are included. The claim adds a foraminous member 17 upstream the diaphram but applicant does not show wherein this element involves invention. The constriction within the faucet itself provides a similar aperture. Also as broadly recited the member is totally lacking in function as it could even be arranged edgewise in the stream.

Claims 16 and 17 aover substantially the same device as claim 15 and are considered to be unpatentable over the patent claims for like reasons. The restricted orifice upstream the diaphram in claim 16 is anticipated by the constriction in the faucet.

Claim 17, lines 4 to 6, groups the apertured 17 and 18 as "apertured diaphrams" which do not materially differentiate from the diaphram with orifice in the patent claim.

Claim 19 recites positively only the orifice in 18, airport 19 and screen 20. The last seven lines attempt to quantitatively limit the elements by stating the desired effect upon the water. This language appears to amount to no more than the last five lines of claim 1 in the patent. The size

of the bubbles has to be within certain limits to form the coherent jet. The claim therefore recites the same subject matter and not a separate invention.

The claims are considered to be properly rejected.

Respectfully,

S.R.H.

Examiner, Division 32.

Plaintiff's Exhibit 17 — 2 App. 183

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

201

Paper No. 10

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

April 6, 1942

Sir:

The case of Elie Aghnides
(Appeal No. 41,833)

Serial [redacted] No. 328,120, will be heard by the Board of Appeals on the 1st day of June, 19 42

The hearings will commence at 9.30 A. M. and as soon as the argument in one case is concluded the succeeding case will be taken up.

If any party, or his attorney, shall not appear when the case is called, his right to an oral hearing will be regarded as waived.

The time allowed for arguments is as follows:

Ex parte cases; thirty minutes;
Inter partes appeals: Interlocutory and final hearings when no testimony has been taken, thirty minutes each side; final hearing when testimony has been taken, one hour each side.

By special leave, obtained before the argument is commenced, the time may be extended.

The appellant shall have the right to open and conclude in inter partes cases, and in such cases a full and fair opening must be made.

Briefs in inter partes appeals must be filed in accordance with the provisions of Rules 144 and 163, as amended.

Respectfully,

Commissioner of Patents.

To

36

To Mr. John Boyle, Jr.,
801 Wash. Loan & Trust Bldg.,
Washington, D. C.

328120

BOARD OF APPEALS
MAY 27 1942
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

Application of Elie Aghnides
Ser. No. 328,120

Before the Board of Appeals

Appeal No. 41,853

Hon. Commissioner of Patents
Washington, D. C.

Sir:

The above entitled appeal has been set for hearing June 1, 1942. It is respectfully requested that another date be set for the hearing because of the inability of the applicant to be present on account of another engagement. The applicant desires to make certain tests in the presence of the Board. Under date of yesterday, he writes that the Inventor's Exposition in New York, where applicant resides, will open on June 1, and that he has made arrangements to demonstrate to certain people at that time, another invention relating to an implement of war and for that reason cannot be present. The clerk advises that the case can be set for July 1, 1942.

Respectfully submitted,

May 26, 1942

John Berg
Attorney

37

Plaintiff's Exhibit 17

[illegible]01-a

2 App. 185

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

Paper No. 12

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

May 27, 1942

Sir:

The case of Elie Aghnides

Appeal No. 41,833

Serial ~~Interference~~ No. 328,120, will be heard by the Board of Appeals on the 1st day of July, 1942.

The hearings will commence at 9.30 A. M. and as soon as the argument in one case is concluded the succeeding case will be taken up.

If any party, or his attorney, shall not appear when the case is called, his right to an oral hearing will be regarded as waived.

The time allowed for arguments is as follows:

Ex parte cases, thirty minutes;
Inter partes appeals: Interlocutory and final hearings when no testimony has been taken, thirty minutes each side; final hearing when testimony has been taken, one hour each side.

By special leave, obtained before the argument is commenced, the time may be extended.

The appellant shall have the right to open and conclude in inter partes cases, and in such cases a full and fair opening must be made.

Briefs in inter partes appeals must be filed in accordance with the provisions of Rules 144 and 163, as amended.

Respectfully,

Commissioner of Patents.

To

To Mr. John Boyle, Jr.
801 Washington Loan & Trust Bldg.
Washington, D. C.

328,120

U.S. GOVERNMENT PRINTING OFFICE 11—10004

 Plaintiff's Exhibit 17

#13

JUL 3 1942
U. S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

In re application of :
ELIE AGHNIDES : Before the
Serial No. 328,120 : Board of Appeals
Filed Apr. 5, 1940 :
FLUID MIXING DEVICES :

-----ooo-----

B R I E F

The invention forming the subject matter of the appealed claims is an improvement upon applicant's prior patent 2,210,846. This is the only reference that is now relied upon by the Examiner. The ground of rejection is stated in the first three lines of the Examiner's Statement to be that of double patenting. Applicant's patent was granted only after an appeal to the Board of Appeals, and much of the reasoning upon which the Examiner had heretofore finally rejected applicant's patent is to be found in the reasoning of the statement by the Examiner on appeal.

The invention of this application relates to a device that is applied to a water faucet for the purpose of making a jet of water containing air bubbles disseminated throughout the jet. In this application the bubbles are of such a size that they will be retained in the flowing jet on discharge but will escape precipitately from the water after disruption of the flowing jet. This distinction forms the basis of claim 19 which is the broadest claim.

The disclosure in the prior patent to applicant was of a generic type and the claims allowed were of a generic type. Claim 1 of the patent was allowed on the basis of novelty of the closing lines as follows:

3 1

"means in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet".

The remaining claims were also allowed by the Board of Appeals based on the novelty of the "means" clause at the end of each claim. The reference in that case was a British patent which pictorially bore some similarity to the patentee's device. The difference was that in the British patent a spray of water was produced instead of a bubbly jet. The reason for the difference was that the resistance of the screen in the patent was sufficient for mixing the water with air, whereas in the British patent there was not sufficient resistance to accomplish this purpose. On the basis of that difference in function, the Board allowed the claims of the patent.

In the amendment filed November 14, 1940, applicant points out the improvements that he has made and that are disclosed in this application but not disclosed in his prior patent. Briefly, what the applicant discovered was that the extent to which the bubble would remain in the jet depended on the size of the bubble, i.e. the length of time that the bubble would remain in the jet after discharge from the faucet. If the bubble is very small it will not discharge from the water upon disruption of the jet, such as takes place when the water is discharged into a glass. The water will remain cloudy as if the water was in emulsified form. However, if a certain larger size of bubble is formed the exact particulars of which are described by an example on page 6 of the specification, then the bubble will remain in the

jet "on discharge but will escape precipitately from the water after disruption of the flowing jet". This distinction between the applicant's patent and claim 19, on appeal, was stated in applicant's remarks to the amendment filed May 26, 1941, as follows:

> "The Examiner says that the Agnnices patent shows and claims the same structure having the same mode of operation as the device of the claims but this is not so. The patent discloses a device for producing a bubbly jet but does not show a device for producing the particular bubbly jet that is claimed. While he described in his patent 2,210,486 how a bubbly jet can be obtained by placing in the path of one or more streams flowing from the upstream diaphragm with substantial kinetic energy, one or more superposed fine wire mesh screens having holes of about 0.6 sq. mm., he did not disclose at that time that when resistance by the screen attains a certain degree, bubbles having different characteristics can be obtained, these bubbles also being small enough to be retained in the jet.
>
> We commend to the Examiner a careful reading of the amendatory matter on pages 1 and 2 of the last amendment. Having made the discovery that he did, that the length of time that the air bubble remained in the jet depended on the degree of division of the fluid mixture, he secured the desired division to produce the desired jet by proportioning the resistance offered by the screen to the apertured area of the diaphragm. This was not taught in the first patent and therefore claim 15 defines a specific type of bubble which is, of course, comprised in the complete range of bubbles small enough to be retained in the jet, as covered by his patent."
>
> (Note: The claim erroneously numbered 15 in the above paragraph is now appealed claim 19).

The applicant's position with respect to claim 19 can be summed up as follows: In his prior patent he made a broad disclosure for making a bubbly jet. In his present application he discloses a species not described in his prior application. Applicant is now claiming that species and differentiating it from his former patent with a means clause followed by a description of the character of the jet that is produced on discharge

namely one where the bubbles will escape precipitately from the water after disruption of the flowing jet, and that this type of jet is produced by proportioning the resistance of the down-stream screen with the cross sectional area of the up-stream orifice. This form of claim was approved by the Board in drawing the distinction of applicant's patent over the prior art. The reasoning which led to the allowance of such claims in the patent is equally applicable here. Indeed it is difficult to see how any other suitable language could be formulated to define the specific improvement that has been made. In the appeal that was heard leading up to the allowance of the patent, the Examiner took the same type of position as here. He said on page 6 of his Statement in the patent: "The functional statement does not teach how the British patent would have to be modified to obtain the result".

The remaining claims are specific to certain elements of structure disclosed in various species. Claim 15 is limited to "a foraminous member upstream the apertured diaphragm". This reads on aperture 17, Fig. 3; screen 23, Fig. 4; aperture 32, Fig. 6. Claim 16 is limited to "a restricted orifice upstream the apertured diaphragm". Aperture 17, Fig. 3; 22, Fig. 4 and 32, Fig. 6, are restricted orifices upstream the apertured diaphragms 18, 24 and 33, Figs. 3, 4 and 6 respectively. Claim 17 is limited to "a restricted orifice and foraminous member upstream the apertured diaphragm". This is shown for example in Fig. 4, 22 being the restricted orifice, and 23 the foraminous member. None of these forms are found in applicant's prior patent.

We will now take up and discuss the Examiner's actions and statements. In the Office action dated May 15, 1940, the

Examiner said "In order to point out the difference the limitations must involve structural differences, not the result". This statement was made while decision on appeal of applicant's patent was pending, and in which many of the references, if not all of them, cited by the Examiner in the first Office action were considered and disposed of by the Board of Appeals. In the second Office action, Nov. 27, 1940, the appealed application having eventuated into a patent, the claims were rejected on this patent, on the ground of double patenting. The Examiner stated: "Aghnides who shows and claims the same structure having the same mode of operation as the device of the claims. In page 2 applicant has attempted to distinguish between the results provided by the patented device and those produced by the matter of this application. While there may be a difference in degree of fineness of the air bubbles in the water such difference cannot distinguish the present claims wherein the structure set forth is the same. In order to support a second patent structure patentably distinct from that shown and claimed must be set forth". Notwithstanding the fact that the Board of Appeals disposed of this contention in reversing the position of the Examiner, it was again raised in this application. The Examiner seems to be unwilling to admit or to concede that a"means clause" suitably qualified, as it is in the patent and also in claim 19, defines structure. The doggedly adhered to position of the Examiner is that it is only such elements as chambers, screens, orifices and the like, that define structure, but the Board in the appeal on the patent disagreed with the Examiner. In the Office action dated July 26, 1941, the Examiner again reiterated his position thus:

"The language of claims 15 to 18 points out no material difference over the structure shown and claimed by the patent. The orifice 17 of Fig. 3 in this application is anticipated by analogous elements in Figs. 2, 4 and 5 of the patent. Broadly construed the restricted orifices is indistinguishable from the passage through the faucet which is inherently restricted. Claim 19 attempts to distinguish by language relating to the product. It is not apparent that this requires any change in form or proportions but if so such changes do not constitute patentable subject matter."

The Examiner does not state just what parts and elements in Figs. 2, 4 and 5 of the patent are comparable to or anticipate the orifice 17 of Fig. 3. Claim 16 for instance states that the "restricted orifice is upstream the apertured diaphragm", and no such combination is disclosed in Figs. 2, 4 and 5 of the patent. In a shift of position the Examiner then states that the "restricted orifice is indistinguishable from the passage through the faucet which is inherently restricted", but claims 15 to 18 state that the "restricted orifice and the foraminous member" which are upstream, are in the device which is adapted for connection with the discharge end of a faucet. This limitation directly precludes reading any such limitation into this claim, to say nothing about the tortured interpretation which is given to the language of the claim.

In the Examiner's Statement it is pointed out that there is a certain pictorial dimilarity between certain figures of the patent and certain figures of the application. If the figures of the drawing are merely compared without reading the descriptive portion of the specification, then of course the conclusion that is reached by the Examiner might have some support, but such a comparison between the disclosure of the application and that of the patent is unwarranted.

The Examiner admits that in the species depicted by Figs. 3, 4 and 6 of the application that "the water is however initially forced through a restricted orifice 17, 22 and 32 re-

spectfully whereby applicant states that the flow is improved and a softer jet delivered". In the next paragraph, the Examiner states "It is not pointed out that the initial jet 17, in Fig. 3 for example, has any specific effect on the water stream". Applicant is unable to reconcile these two statements.

In the closing paragraph of Sheet 3, the Examiner says - "The patent to Aghnides has, as pointed out above, substantially the same disclosure and provides the same soft jet of water". It is submitted that a reading of the specification of the application will disprove the fact that the patent and the application have substantially the same disclosure, or that the patent discloses the specific jet of water of the application. The reason for the conclusion of the Examiner is because he is merely making pictorial comparisons between the figures of the patent and that of the specification, and disregarding entirely the disclosure in the specification.

The Examiner applies claim 15 and tries to read it on applicant's patent, but admits that the patent does not have the foraminous member 17, and then disposes of his untenable position by stating that "applicant does not show wherein this element involves invention". It is very specially disclosed on p. 7 of the specification that the presence of this orifice 17 produces a more regular and softer jet. It could not be deduced by mere reasoning that this would be the effect of the orifice 17 in the combination. The Examiner then takes the position that claim 15 does not patentably differ from claim 1 of the patent, but as has been heretofore pointed out, an entirely new specific mode of operation not disclosed in the patent specification is covered by claim 15. The Examiner then goes on to say that the member 17 is totally lacking in function because he says

it could be arranged edgewise in the stream. This objection was never raised during the prosecution of the application, but why would anyone want to put the foraminous member 17 edgewise in the stream. We believe the examiner would have some difficulty in making a diagram showing the member 17 edgewise in the stream. Unless the art so compels, applicant is entitled to claim the position of the foraminous member, limited only by the fact that it is upstream the apertured diaphragm. The specification describes an operative specific embodiment and applicant is entitled to claim that embodiment in as broad language as the state of the art will permit.

We have already discussed the tortured construction of the language of claims 15, 16 and 17 when the examiner attempts to read the restricted orifice on the orifice within the faucet.

The Examiner disposes of claim 19 on the ground that the only element of structure which it recites positively is the orifice 18, the airport 19 and screen 20, and then states in the last seven lines that applicant is attempting to quantitatively limit the elements by stating the desired effects upon the water, and that this language appears to amount to no more than the last five lines of claim 1 of the patent. Of course the closing "means clauses" of claim 1 of the patent and claim 19 are directed to entirely different structures for accomplishing entirely different results. Claim 1 of the patent is a broad claim. Claim 19 of the application is directed to a species not disclosed in the patent and an improvement which embodies an important discovery. The Examiner then says -"The size of the bubbles has to be within certain limits to form a coherent jet", but admitting

arguendo that such is the case it is not seen what bearing that fact has upon the patentability of claim 19.

After the hearing, a demonstration was made before the members of the Board of Appeals. In one test, a division of the air was made in which the bubbles were so small that when the stream was directed into a glass, the very small bubbles remained in suspension in the water for some time. Another test was made where the division of the air was such as is set forth in this application. When such a jet of water was disrupted by directing the stream into a glass, the bubbles immediately disappeared. A comparison was then made by directing these two jets into a receptacle with a soap solution therein. The very fine bubbles of the first test produced a relatively small amount of soap bubbles on the surface of the water. Using the jet of applicant's invention a foam was produced much greater in quantity and in which the bubbles were uniform in size. Directing the water directly from the faucet into the soap solution produced bubbles from the impact and agitation of the water against the bottom of the receptacle, but such bubbles were not uniform in size and did not produce a lather as satisfactory as with applicant's invention. Tests were then made with and without the use of the restricted orifice, which demonstrated the benefits of this orifice as disclosed in applicant's specification.

Since the disclosure in this application produces an improvement in the jet shown in applicant's prior patent, and since that improvement was not obvious but was learned only after experimenting with the jet, it is submitted that the public ought to have the benefit of this improved disclosure, so that they can produce the best form of jet when the patent expires, and the applicant ought to have the patent on such improvement as his reward for having made this disclosure.

July 2, 1942. 328120 47

Respectfully submitted.

John Boy C. Hall

Plaintiff's Exhibit 17 2 App. 195

Paper No. 14

U. S. PATENT OFFICE
BOARD OF APPEALS
SEP 9 - 1942
MAILED

Appeal No. 41,833

MSP

Hearing:
July 1, 1942

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

Ex parte Elie Aghnides

Application for Patent filed April 5, 1940, Serial No. 328,120. Fluid Mixing Devices.

Mr. John Boyle, Jr. for applicant.

This is an appeal from the action of the examiner finally rejecting claims 15 to 19, inclusive.

Claim 15 may be taken as an example.

15. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

As to claims 15 to 18, inclusive, it seems to be the examiner's position that there is no invention in the in-

48

328120

#41,833

corporation of the foraminous member 17 (Fig. 3) in the structure covered by applicant's copending patent. This restriction was used, according to the specification, to produce a more regular and softer jet, which character of jet the device was demonstrated to produce. We cannot conclude that there is no invention in the novel arrangement.

Claim 19 does not distinguish over the patent claims except as to proportioning of the size of the orifices in screen 16 or 48 and others of the patent, as well as the size of screens 20, 28, 40, 42, etc., in such a way that bubbles of such size are produced that they will be retained in the flowing jet but will escape precipitately from the water after disruption of the flowing jet.

We regard the proportioning of the sizes of the elements of the patent claims to secure the result stated as devoid of invention, that is, any skilled mechanic would see that the holes in the elements 36, 40, 42 (Fig. 4 of the patent), for instance, were properly positioned and proportioned to produce the desired effect.

We see no invention in making the openings so large that the bubbles would immediately disappear from the jet as it is received in a glass.

The decision of the examiner is affirmed as to claim 19, but is reversed as to claims 15 to 18, inclusive.

E. J. Morgan
Examiner-in-Chief)
C. R. Hazzard
Examiner-in-Chief) BOARD OF APPEALS
Examiner-in-Chief)

Mr. John Boyle, Jr.,
801 Wash. Loan & Trust Bldg.,
Washington, D. C.

September 9, 1942

Nov 13 '42 Plaintiff's Exhibit 17 2 App. 197 15/C

U. S. PATENT OFFICE
NOV 17 1942
DIVISION XXXII.

IN THE UNITED STATES PATENT OFFICE

Applicant Elie P. Aghnides
Ser. No. 328,120
Filed April 5, 1940
For Fluid Mixing Devices

Div. 32

Honorable Commissioner of Patents,

Sir:

Please amend the above entitled application as follows:

Cancel from the drawing Figs. 1, 2 and 5. Renumber Figs. 3, 4 and 6 as 1, 2 and 3, respectively.

Cancel beginning page 1, line 7 of the specification, after the period, up to page 3, line 5, including the amendments thereto.

Page 1, line 4, before the period, insert -and is an improvement on my patent 2210,846 granted Aug. 6, 1940-.

Page 3, cancel the last line.

Page 4, line 1, cancel ",2-6" and substitute -2 and 3-.

Cancel page 4, lines 2-22 inc.;

Page 4, line 23, cancel "3" and substitute -1-; line 25, before "except" insert -of my aforesaid patent-; line 27, cancel "4" and substitute -2-.

Page 5, cancel lines 1-5 and line 19 to end of page; line 6, cancel "6"and substitute -3-; line 7, cancel -"Figs. 1 and 3/and substitute -Fig. 1-.

Cancel page 6; and page 7, lines 1-13 inc; and lines 26-34.

Page 7, line 15, cancel "3" and substitute -1-; line 15, cancel "4" and substitute -2-; line 21, cancel "4" and substitute -2-. Page 8, cancel all but the last three lines.

Cancel claim 19.

328120

2 App. 200 **Plaintiff's Exhibit 17**

Div. 32 Room 511 Paper No. 17

Address only "The Commissioner of Patents, and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
RICHMOND, VA.

All communications respecting this application should give the serial number, date of filing, and name of the applicant

Please find below a communication from the EXAMINER in charge of this application.

P.N:C.

Commissioner of Patents.

☆ GPO 16-27315-1

Jonn Boyle, Jr.
801 Washington Loan & Trs.
Washington, D. C.

Applicant: Elie Agnnides

Ser. No. 328,120
Filed Apr. 5, 1940
For FLUID FILING DEVICES

MAILED
NOV 19 1942

Amendment Nov. 13, 1942.

The removal of Figs. 1, 2 and 5 would leave Figs. 3, 4 and 6 in one corner of the sheet. The draftsman therefore, states that these figures must be relocated on the drawing. A new drawing with these figures only is required.

The Statutory period continues to run from the decision of Sept. 9, 1942.

JRH.

Examiner.

328120

53

Plaintiff's Exhibit 17 2 App. 201

#18

U.S. PATENT APPLICATION DIV. DEC 11 '42 U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

U.S. PATENT OFFICE DEC 15 1942 DIVISION XXXII.

Applicant Elie Aghnides
Ser. No. 328,120
Filed Apr. 5, 1940
Fluid Mixing Devices

Div. 32
Room 511

Honorable Commissioner of Patents,

Washington, D. C.

Sir:

In response to the Office Action dated Nov. 19, 1942, cancel the present sheet of drawings and substitute the following.

Dec. 10, 1942

Respectfully submitted,

John Doyle

Attorney

Original Division 32

54 328120

Plaintiff's Exhibit 17

#19

32

TITLE REPORT

No. 320120 C. P.

Name Elie Agnides

The title appears from the assignment records to be vested in:

Inventor

Examined up to and including Dec. 3, 1942

This certificate dated Dec. 10, 1942.

Grattan Purcell

Asst. Chief of Assignment Division.

S

No further assignments appear to have been received for record including

GOVERNMENT PRINTING OFFICE 11—9778

Plaintiff's Exhibit 17 2 App. 203

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

181—R

PRN: CA
Serial No. 328,120

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

DEC 23 1942

RICHMOND ~~WASHINGTON~~ VIRGINIA

ELIE P. AGHNIDES

Your APPLICATION for a patent for an IMPROVEMENT in FLUID MIXING DEVICES filed Apr. 5, 1940 has been examined and ALLOWED with 4 claims.

The final fee, THIRTY DOLLARS ($30), WITH ONE DOLLAR ($1) ADDITIONAL FOR EACH CLAIM ALLOWED IN EXCESS OF 20 (no less sum can be accepted), must be paid not later than 6 MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld; SEE REVISED STATUTES, SECTION 4885 AS AMENDED BY ACT OF CONGRESS APPROVED AUGUST 9, 1939.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about 4 weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF THE INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If it is desired to have the patent issue to an ASSIGNEE OR ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of the final fee.

The final fee will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Attention is called to Executive Order No. 8389 of April 10, 1940, as amended, and General License No. 72 issued thereunder. If a foreign country designated in the Order, or any national thereof, has, on or since the effective date of such Order, had an interest of any nature whatsoever, direct or indirect, in this application or in the letters patent to be issued thereon, a report on Form TFR-172 must be filed with the Treasury Department at least 20 days before the payment of the final fee. Copies of Form TFR-172 may be obtained from any Federal Reserve Bank, the Governor or High Commissioner of any territory or possession of the United States, or from the Division of Foreign Funds Control, Treasury Department, Washington, D. C.

Respectfully,

Commissioner of Patents.

John Boyle, Jr.
801 Washington Loan & Trst.
Washington, D. C.

5-6

328120

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED

16—25069-1 U. S. GOVERNMENT PRINTING OFFICE

2 App. 204 Plaintiff's Exhibit 17

PATENTEE OF INVENTIONS
INTERNATIONALLY LICENSED

WICKERS 1-4000

E. P. AGHNIDES

ENGINEER--INVENTOR

527 LEXINGTON AVENUE

NEW YORK

MEDAL AT THE UNIVERSAL
EXHIBITION OF BRUSSELS

B

1-43 12600 30.00

March 17,1943

Commissioner of Patents
Department of Commerce
United States Patent Office
Richmond,Virginia

Dear Sir:

Serial No. 328,120 - PRN:CA

In reply to your communication of December 23,1942, I beg to enclose a check of $30.00 to cover the final fee for the patent granted me for "Fluid Mixing Devices".

Respectfully yours,

E P Aghnides

Form APC-13P,duly notorized and signed is herewith attached.

328120

Plaintiff's Exhibit 17 2 App. 209

Form APC-13P
November 17, 1942

UNITED STATES OF AMERICA

OFFICE OF ALIEN PROPERTY CUSTODIAN

Washington, D. C.

For Reporting Certain Patent Applications

Inventor Elie T. Aghnides

Citizenship Greek

Address Shelton Hotel Lexington Ave. at 49 New York, N.Y.

Title of Invention FLUID MIXING DEVICES

Serial Number 328,120 PRN: CA

Assignee

Citizenship

Address

Interest Transferred

Date of Oath

Interest in the Invention or Application which is held by the reporter (if other than the Assignee)

Name of person forwarding to reporter (if other than inventor or Assignee)

Address

Signed

Address

I, Elie P. Aghnides, do solemnly swear (or affirm) that the statements made in answer to the foregoing questions are true and complete to the best of my knowledge and belief.

Elie P. Aghnides

(Title)

Subscribed and duly sworn to before me this Seventeenth day of March, 1943 at the city of New York, County of New York and state of New York, Kathryn L. McEnroe

TO BE FILLED IN BY PATENT OFFICE

Above application filed on

and received Serial Number

This [illegible]
entered [illegible]
to which it is [illegible]

C. L. Roberts
Chief, Application Division

Form 700

District Court of the United States

DISTRICT OF Middle District of North Carolina

COMMISSIONER OF PATENTS
MAR - 1 1953
DEPT.

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 3rd day of March, 1953, in this court an action, suit, or proceeding No. 728 G., entitled:

Name Elie P. Aghnides, Plaintiff,

Address 46 West 54th Street, New York 19, New York

versus

Name The Meyer's Company, Defendant,

Address Greensboro, North Carolina

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	Aug. 6, 1940	Elie P. Aghnides
2	2,316,832	April 20, 1943	Elie P. Aghnides
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this 3rd day of March, 1953, at Greensboro, North Carolina

Henry Reynolds
Clerk of said Court.

By [signature]
Deputy Clerk

U. S. GOVERNMENT PRINTING OFFICE 7—2016

AO Form 120

In Re Patents

United States District Court

for the

Southern District of New York

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 3rd day of June, 19 53, in this court an action, suit, or proceeding No. Civ. 85-272, entitled:

Name Marshall Metal Products Inc. (New York), Plaintiff,

Address The Meyer's Company (North Carolina)

versus

Name Elie P. Aghnides, Defendant,

Address New York

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1 2,210,846	Aug. 6, 1940	To deft.
2 2,316,832	Apr. 20, 1943	" "
3		
4		
5		

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

.....,
Clerk.

Date June 3rd, 19 53. By .....,
Deputy Clerk.

Form 760

District Court of the United States

DISTRICT OF MIDDLE DISTRICT OF NORTH CAROLINA

SOLICITOR

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

AUG 5 - 1954

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 6th day of July U. S. PATENT OFFICE, 1954, in this court an action, suit, or proceeding No. 857-G, entitled:

Name Elie P. Aghnides, Plaintiff,

Address New York 19, N. Y.

versus

Name S. H. Kress & Co., Defendant,

Address Greensboro, N. C.

brought upon the following patents:

B

	PATENT NO.	DATE OF PATENT	PATENTEE
1	2,210,846	August 6, 1940	Elie P. Aghnides
2	2,316,832	April 20, 1943	Elie P. Aghnides
3			
4			
5			

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this 4th day of August, 1954, at Greensboro, N. C.

HENRY REYNOLDS
Clerk of said Court.

BY Betty H. Herrington
Deputy Clerk

U. S. GOVERNMENT PRINTING OFFICE 7—3016

AO Form 120

In Re Patents

United States District Court

for the

S. D. N. Y.

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SOLICITOR

SIR:

SEP 21 1954

U. S. PATENT OFFICE

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 16th. day of September, 1954, in this court an action, suit, or proceeding No. Civ. 95-355, entitled:

Name Melard Manufacturing Corporation, Plaintiff,

Address New York

versus

Name Elie P. Aghnides, Defendant,

Address New York

B

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1 2,210,846	Aug. 6, 1940	Aghnides
2 2,316,832	Apr. 20, 1943	Aghnides
3		
4		
5		

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued:

WILLIAM V. CONNELL
Clerk.

Date Sep. 20, 19 54. By Robert Tollner
Deputy Clerk.

AO Form 120

In Re Patents

(P. 214)

United States District Court

for the

NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

COMMISSIONER OF PATENTS,
Washington 25, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392; 35 USC 70), you are advised that there was filed on the 18th day of JANUARY, 1955, in this court an action, suit, or proceeding No. 55C 84, entitled:

Name MELARD MANUFACTURING CORPORATION, Plaintiff,

Address 432 Austin Place, New York

versus

Name CHASE BRASS & COPPER CO., INC., Defendant,

Address Waterbury Connecticut and doing business in Chicago, Illinois

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1 2,210,846	August 6, 1940	Elie P. Aghnides
2 2,316,832	April 20, 1943	Elie P. Aghnides
3		
4		
5		

In the above-entitled case, on the ..... day of ....., 19 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

Date January 18, 1955

H. Doumas, Clerk.

By Marquerite Johnson, Deputy Clerk.

63

32:1-0

Plaintiff's Exhibit 17 2 App. 215

421

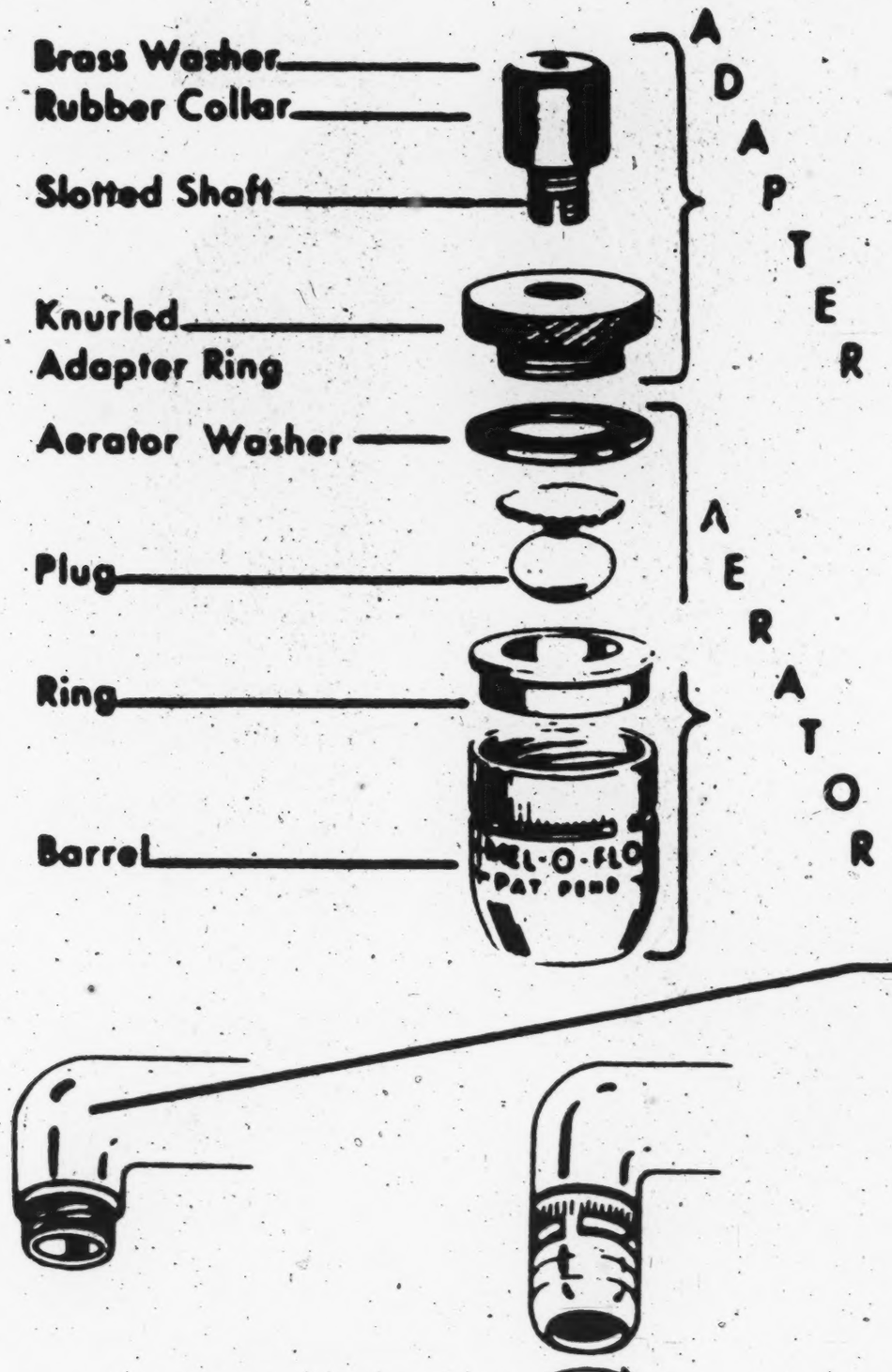
1940

CONTENTS

1.	Application papers.	26.	
2.		27.	
3.		28.	
4.		29.	
5.		30.	
6.		31.	
7.		32.	
8.		33.	
9.		34.	
10.		35.	
11.		36.	
12.		37.	
13.		38.	
14.		39.	
15.		40.	
16.		41.	
17.		42.	
18.		43.	
19.		44.	
20.		45.	
21.		46.	
22.		47.	
23.		48	
24.		49.	
25.		50.	

U.S. GOVERNMENT PRINTING OFFICE 16—11878

32-120



INSTALLATION INSTRUCTIONS

THE MEL-O-FLO JET-AERATOR scientifically super-charges water with BILLIONS of BUBBLES of air producing an oxygen-enriched splashless flow.

For best results follow instructions carefully.

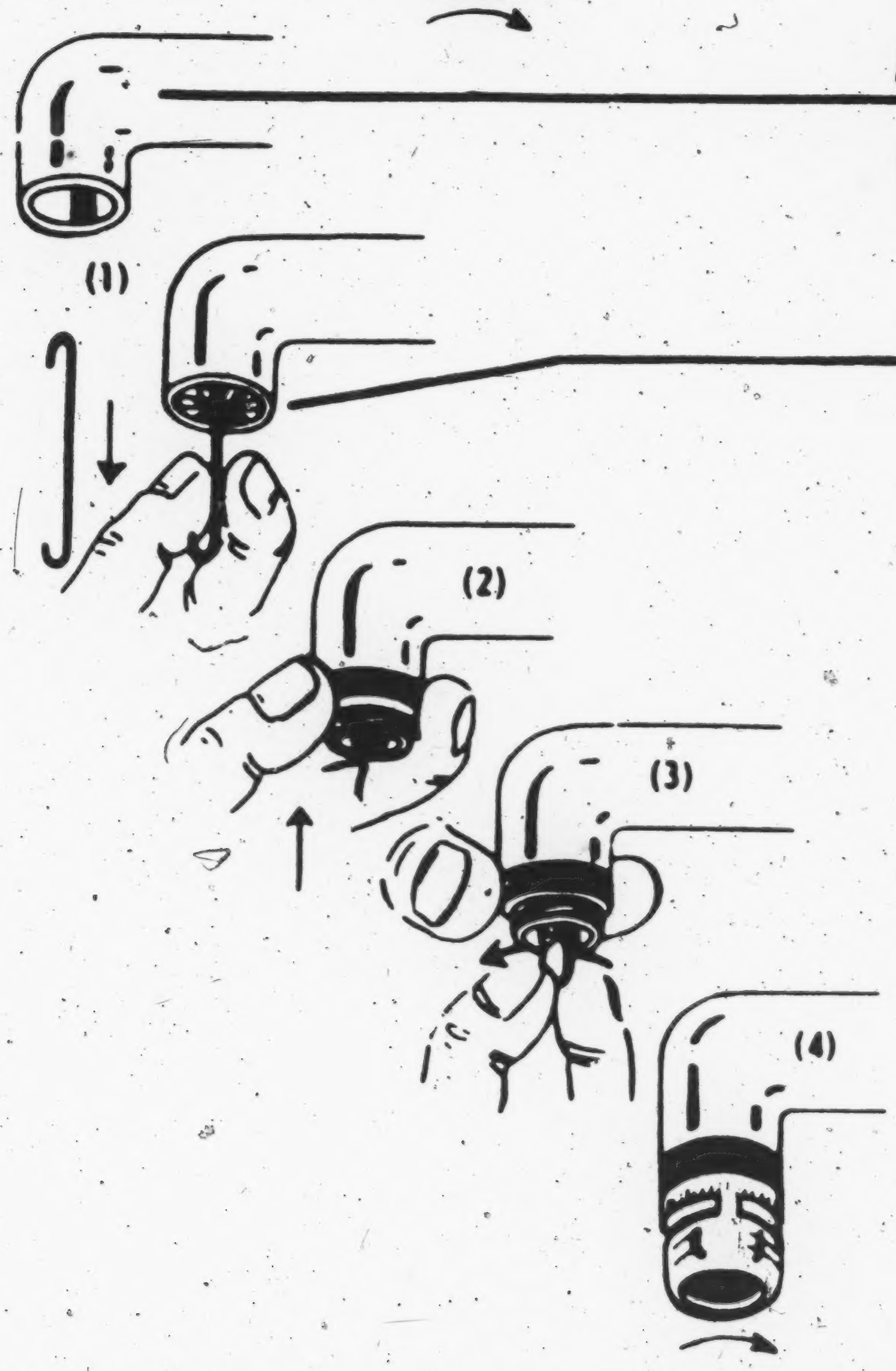
Your MEL-O-FLO JET-AERATOR ASSEMBLY contains an AERATOR plus an INTERNAL ADAPTER which connects the AERATOR to any make of faucet.

*For most faucets THREADED ON THE OUTSIDE**

use of the INTERNAL ADAPTER is not necessary. To connect, unscrew AERATOR from ADAPTER and then screw AERATOR onto the spout *using the Aerator WASHER as a seal.*

***(It may be necessary to remove a screen holder to expose the thread.)**

For faucets NOT THREADED ON THE OUTSIDE



the INTERNAL ADAPTER is required and used as follows:

(1) Inspect opening in spout.
If opening is clear, proceed to step (2).
If opening has a spring insert, remove it with a bent pin or clip by hooking the bent pin on the insert and pulling down.

(2) Unscrew AERATOR from ADAPTER and push ADAPTER ASSEMBLY into spout as far as possible. The ADAPTER should fit fairly snugly in the spout.
If Adapter *fits loosely*, unscrew SLOTTED SHAFT from KNURLED ADAPTER RING and replace black rubber collar with larger BLUE collar.
If Adapter *will not fit* into spout, unscrew SLOTTED SHAFT from KNURLED ADAPTER RING, remove black rubber collar and BRASS WASHER and replace black rubber collar with smaller RED collar, OMITTING the BRASS WASHER.

(3) Hold KNURLED ADAPTER RING stationary with one hand and turn SLOTTED SHAFT to the *LEFT* with a coin in slot until securely tightened.

(4) Screw AERATOR onto ADAPTER.

CLEANING INSTRUCTIONS

To clean, hold the KNURLED ADAPTER RING tightly with one hand and unscrew the AERATOR BARREL with the other by turning to the LEFT. Remove PLUG and RING and brush teeth of plug. If plug sticks in ring, separate by pushing plug UP through ring. Rinse all parts and replace. To reassemble place ring in barrel and drop plug into ring.

MELARD MFG. CORP • 37-25 32nd St. • Long Island City 1, N. Y.

468,687 COMPLETE SPECIFICATION 1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.1

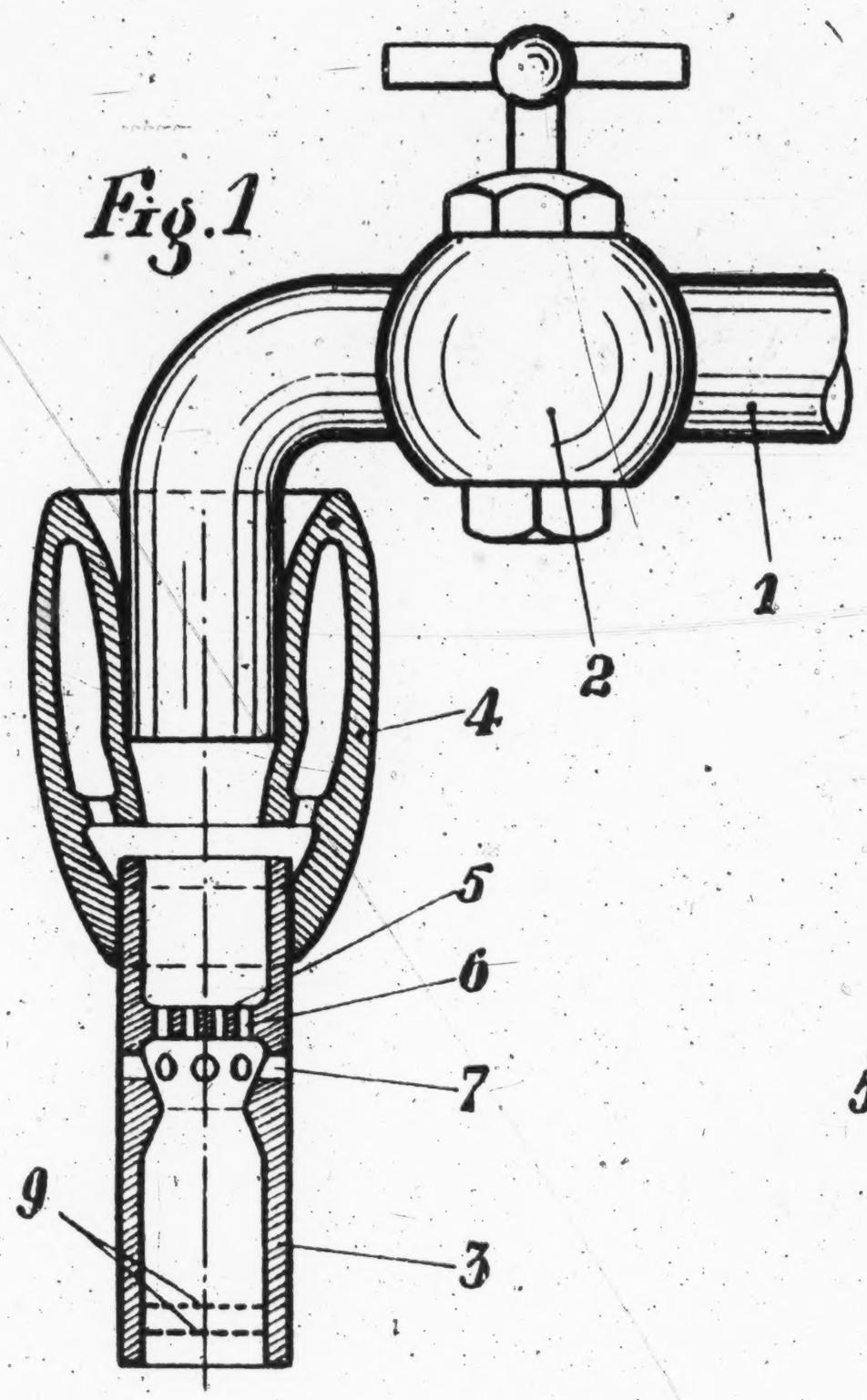


Fig.5

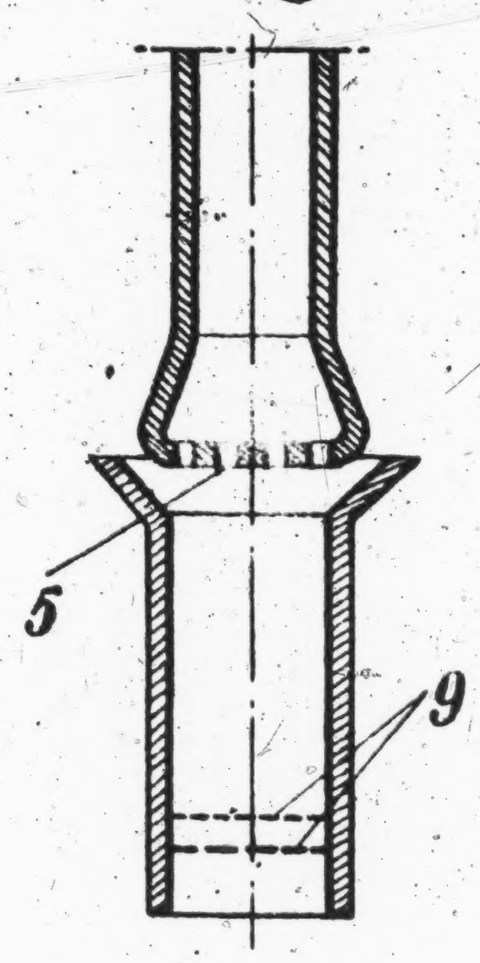


Fig.2

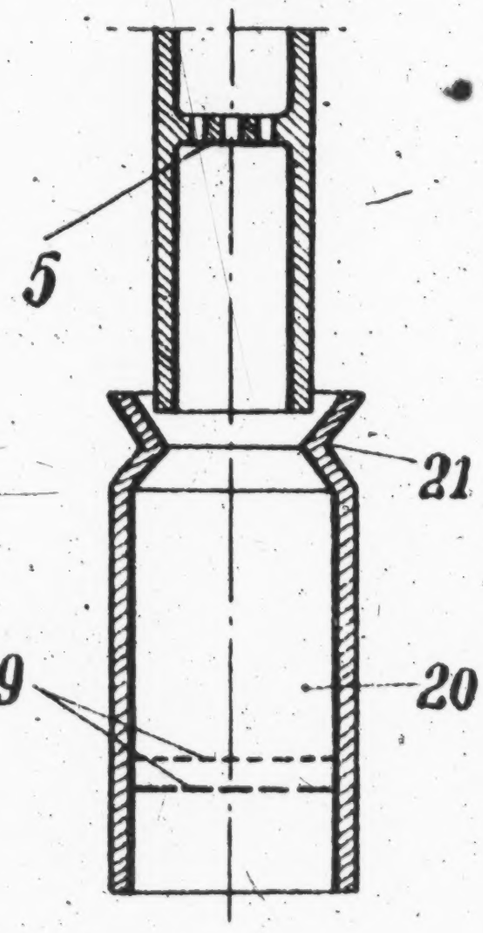


Fig.3

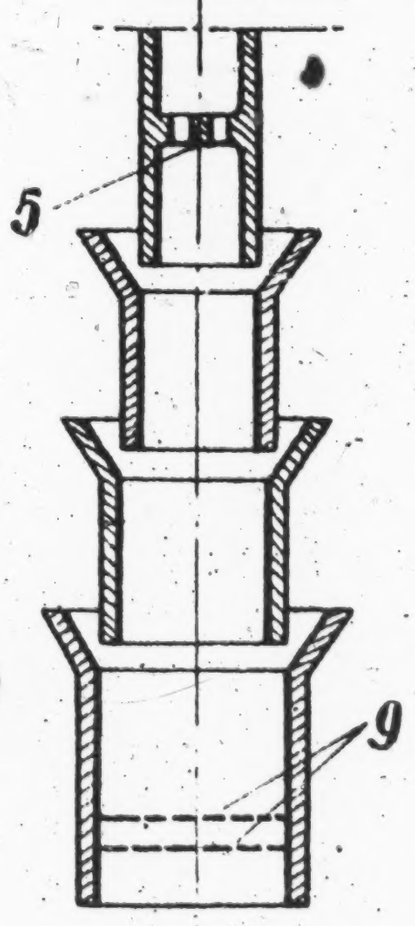
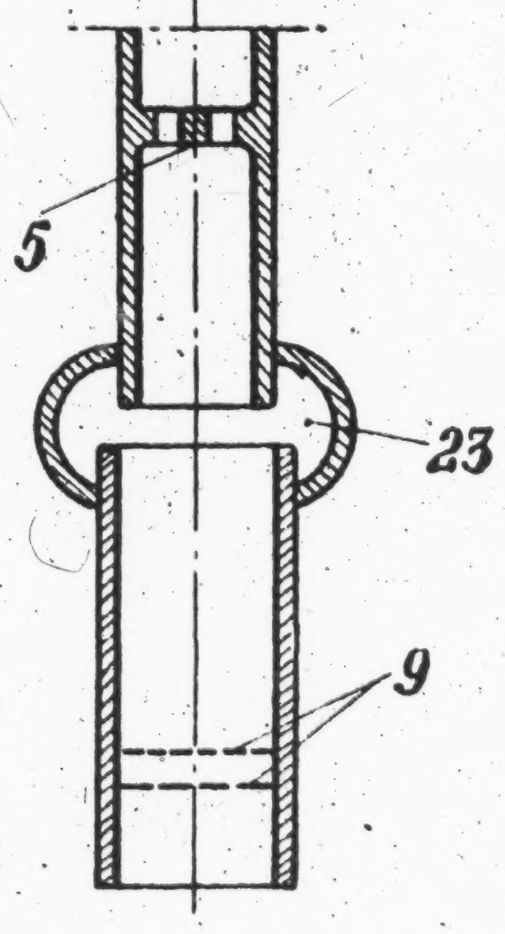


Fig.4



Malby & Sons, Photo-Litho.

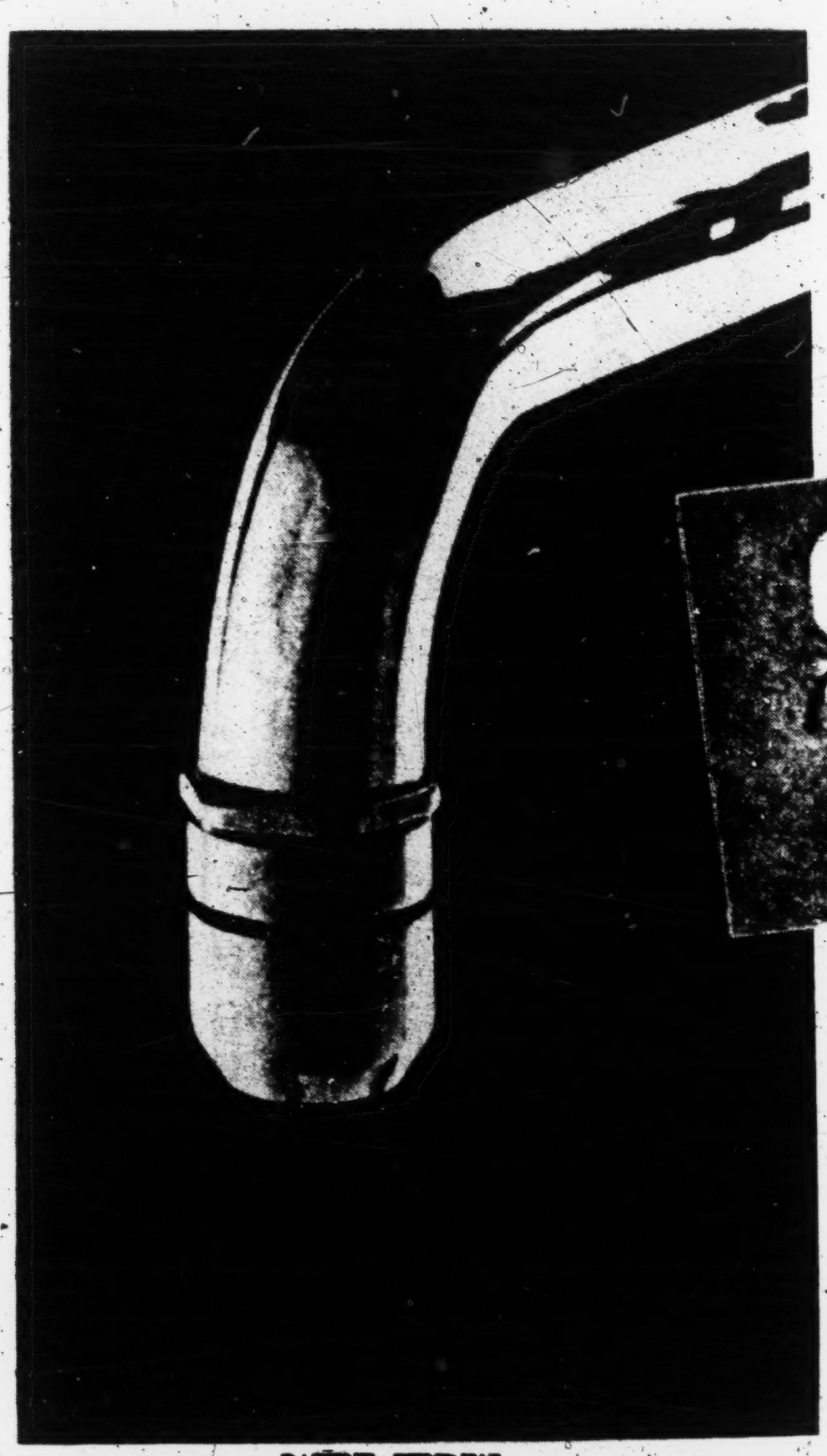
CHICAGO FAUCET NEWS

Issued Monthly by The Chicago Faucet Co., 2700-22 N. Crawford Ave., Chicago, Ill. Vol. 6, No. 5

All parts of Chicago Faucets subject to wear are incorporated in a standardized, removable, interchangeable operating unit and are as easily renewable as an electric light bulb.

NEW REVOLUTIONARY AMAZING

Improves the character of tap water!



PATENT PENDING

SOFTFLO Faucet Equipment

All Chicago Swing-Spout Sink Faucets are now available with Softflo Faucet Spout End, when so ordered, at only small additional cost.

SPLASHLESS

The Softflo Spout End works a miracle in its elimination of splashing. Its stream, even at maximum volume and at high pressure, spreads on the sink bottom or on other surfaces without splash or spatter.

NEUTRALIZES FOREIGN FLAVORS

Because of its aeration of water passing through it, it greatly neutralizes foreign tastes and odors such as chlorine or sulphur by releasing them with the air bubbles. Thus it renders water more palatable for drinking, mixing with beverages, tea, coffee or cocoa, and for cooking.

IMPARTS FEELING OF "SOFT" WATER

The function of the Softflo Spout End is to add oxygen to water passing through it. This added air is in the form of myriads of tiny bubbles, thus greatly reducing the harsh, alkaline "feel" of the water and producing lather more abundantly when mixed with soap chips or powder. It is not claimed that the Softflo transforms hard water to soft by removing the chemical elements that render it hard; but by the addition of air bubbles the water feels "soft" and agreeable to the touch.

CLARIFIES WATER

Clean water passed through the Softflo Spout End is relieved of any cloudiness or murkiness, becoming instantly clear, white and sparkling -- the result of oxygenation.

MAKE YOUR OWN TESTS

These claims are actually conservative, though they may seem hard to believe. We have no desire to impress merely the credulous. So don't accept our claims purely on our "say so." You can satisfy yourself, right in your own office or home, that the Softflo Faucet Spout End does all these things — and more. Order a faucet equipped with one today and convince yourself.

Defendant's Exhibit 26 2 App. 227

SHEET NO. _____ ACCOUNT NO. _____

TERMS NAME Aghnides Royalties

RATING ADDRESS

CREDIT LIMIT

A 5115 MADE IN U.S.A.

1938 DATE	ITEMS	FOLIO ✓	DEBITS	DATE 1938	ITEMS	FOLIO ✓	CREDITS
		VR					
Jan 19		5	8300	Dec 31	To P. L	35	33 00
Feb 3		9	8300 166.00				
Mar 2		16	8300 249.00				
Apr 5		25	8300 83200				
May 2		33	8300 41500				
Jun 1		41	8300 49800				
Jul 5		53	8300 58100				
Aug 3		60	6000 64100				
Sept 2		69	6000 70100				
Oct 3		78	6000 76100				
Nov 2		88	6000 82100				
Dec 7		97	6000 88100				

Complete Specification

True Copy

2 Sheets
Sheet /

33884

DEC 1935

Fig.1

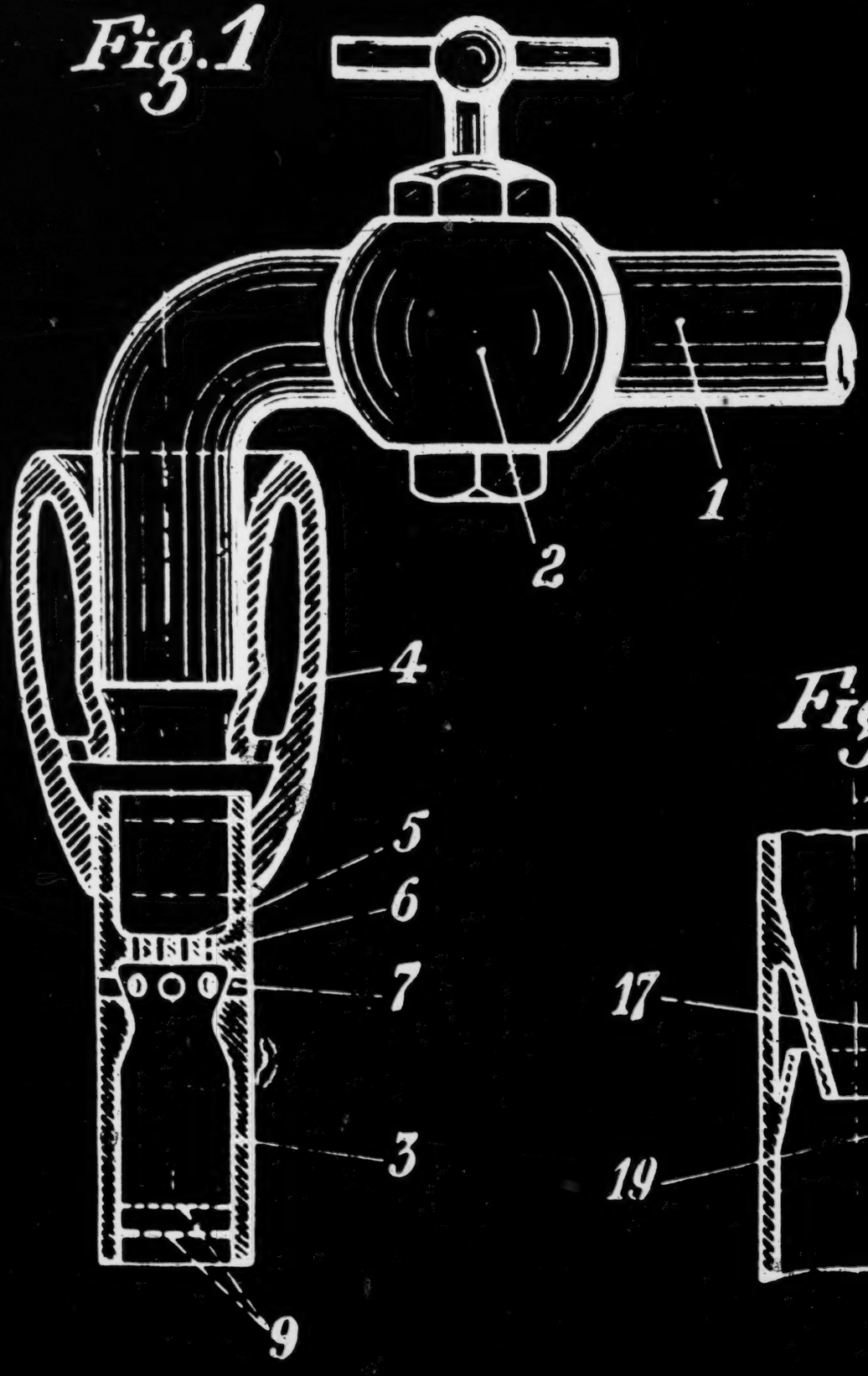


Fig.7

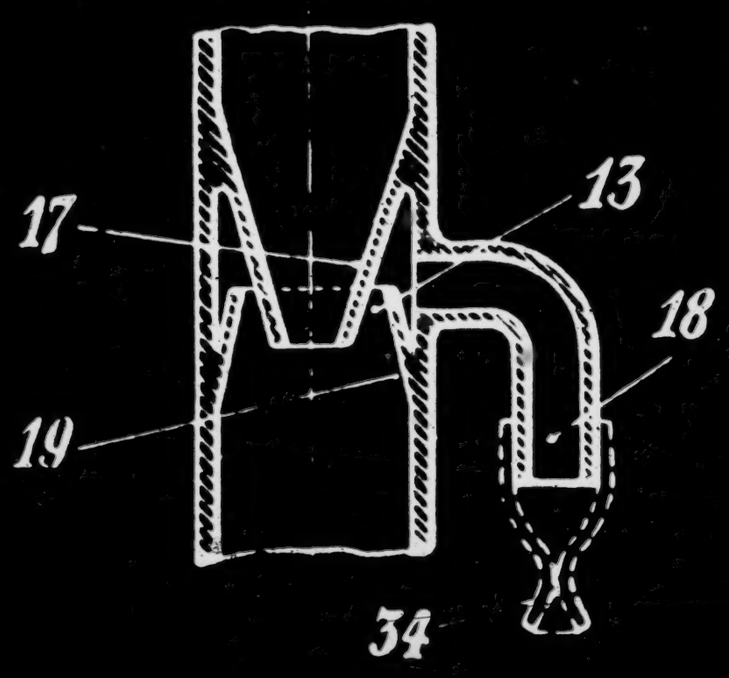
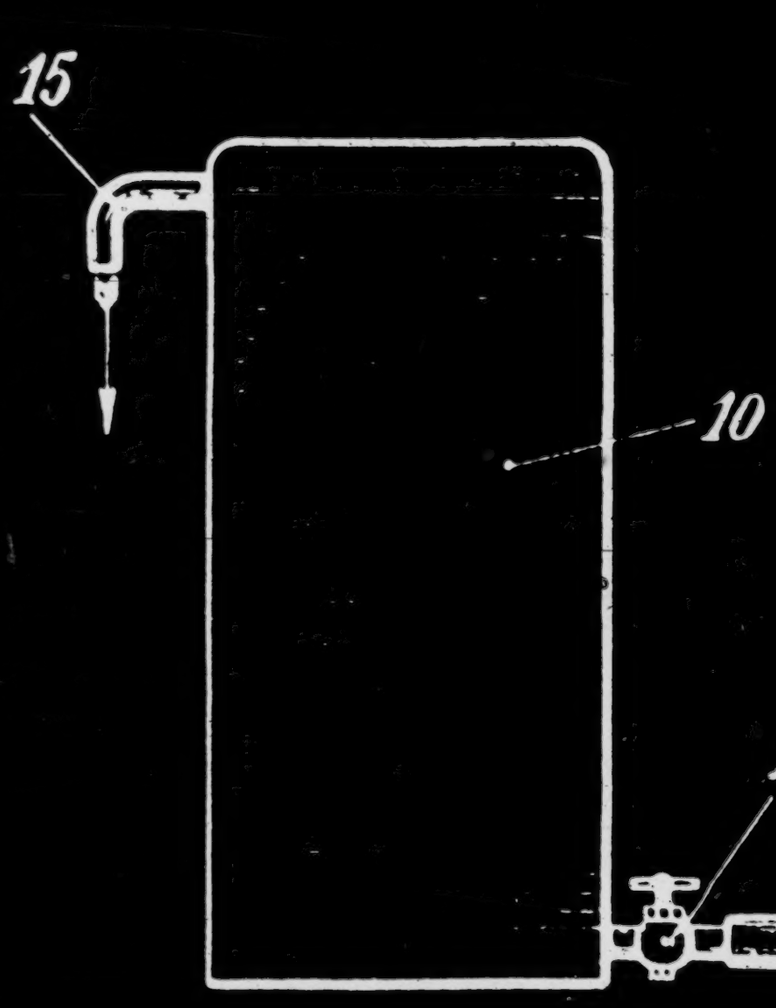
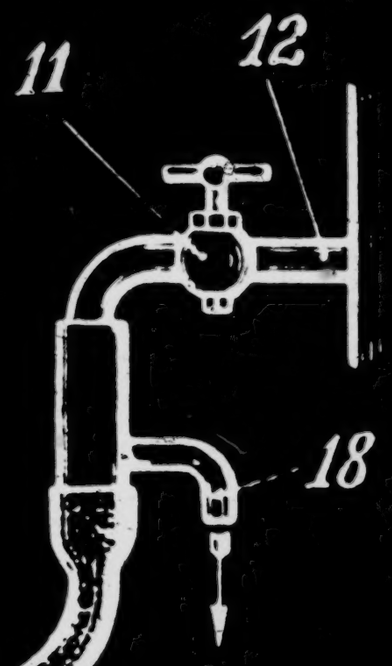


Fig.6





468687

Sheet 2

33884

6 DEC 1935

Fig.2

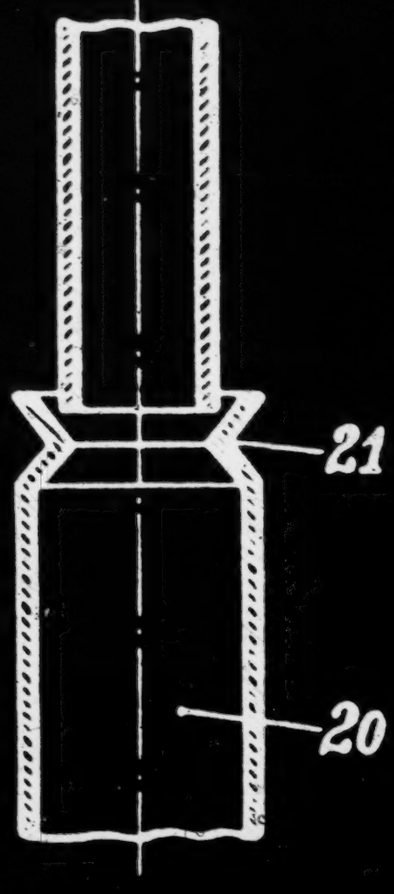


Fig.3

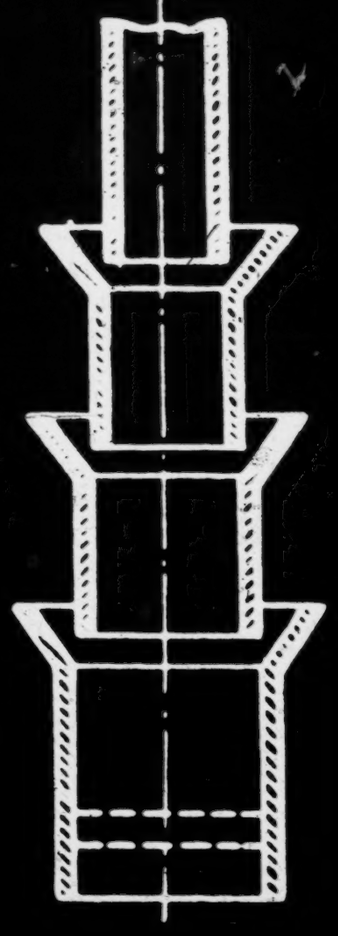


Fig.4

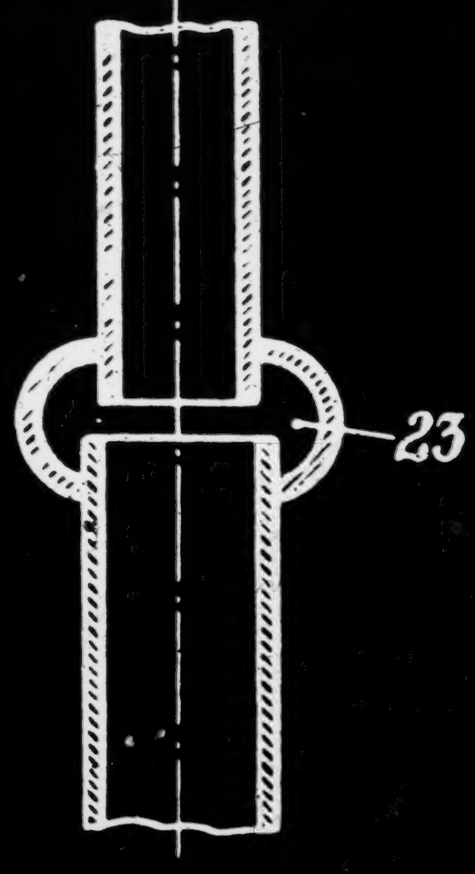


Fig.5

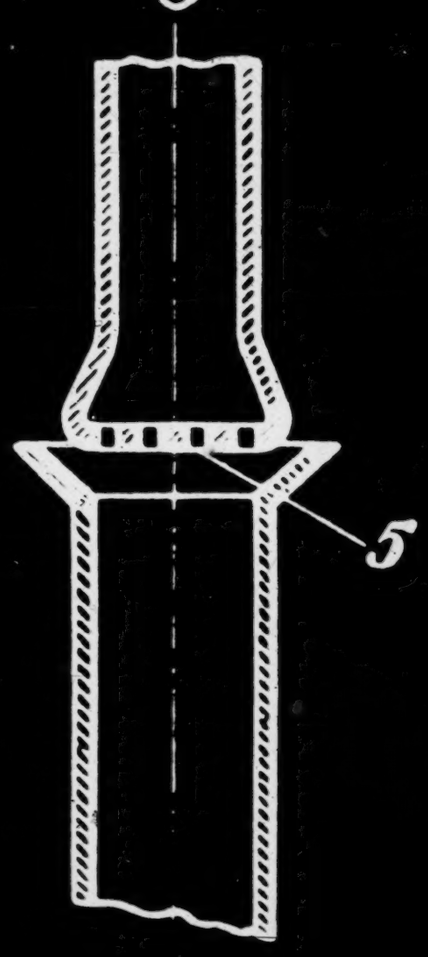
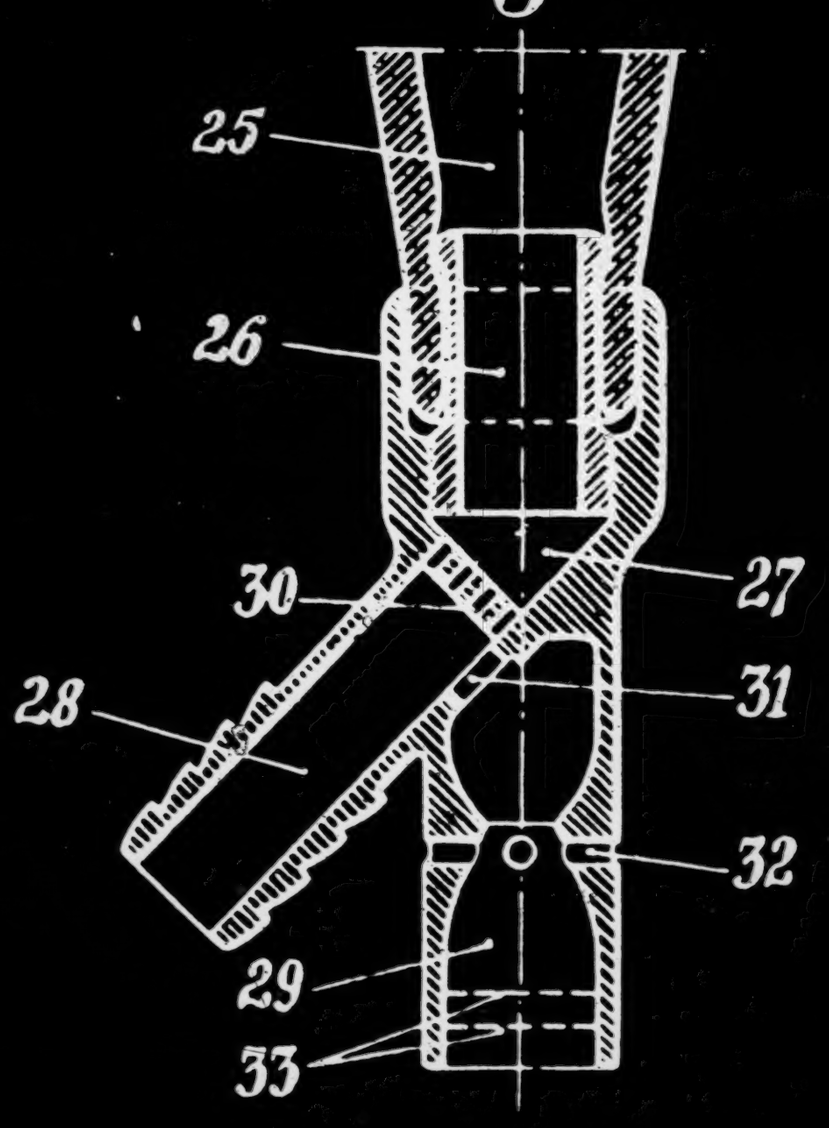


Fig.8



168687

HY. FAIRBROTHER, Agent for Applicants,
30 & 32, LUDGATE HILL, LONDON, E.C.4.

Defendant's Exhibit 44-1 2 App. 243

(No Model.) 3 Sheets—Sheet 1.

J. W. HYATT.

ART OF PURIFYING WATER.

No. 326,221. Patented Sept. 15, 1885.

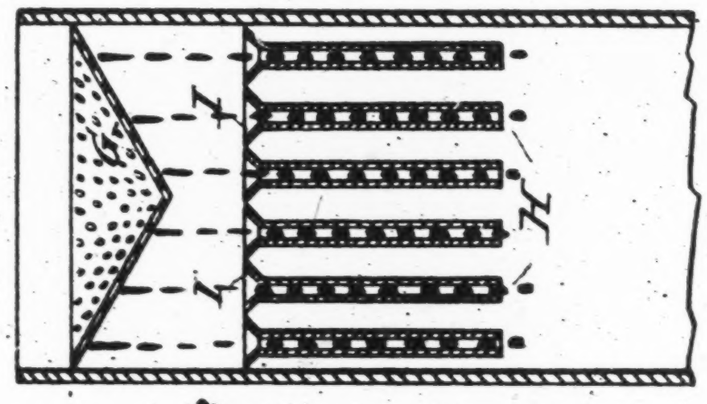


Fig. 2.

Fig. 1.

WITNESSES

Edward Wolff

George Cook

John W. Hyatt INVENTOR

By his Attorney

Rowland Cox

Defendant's Exhibit 44-1 2 App. 245

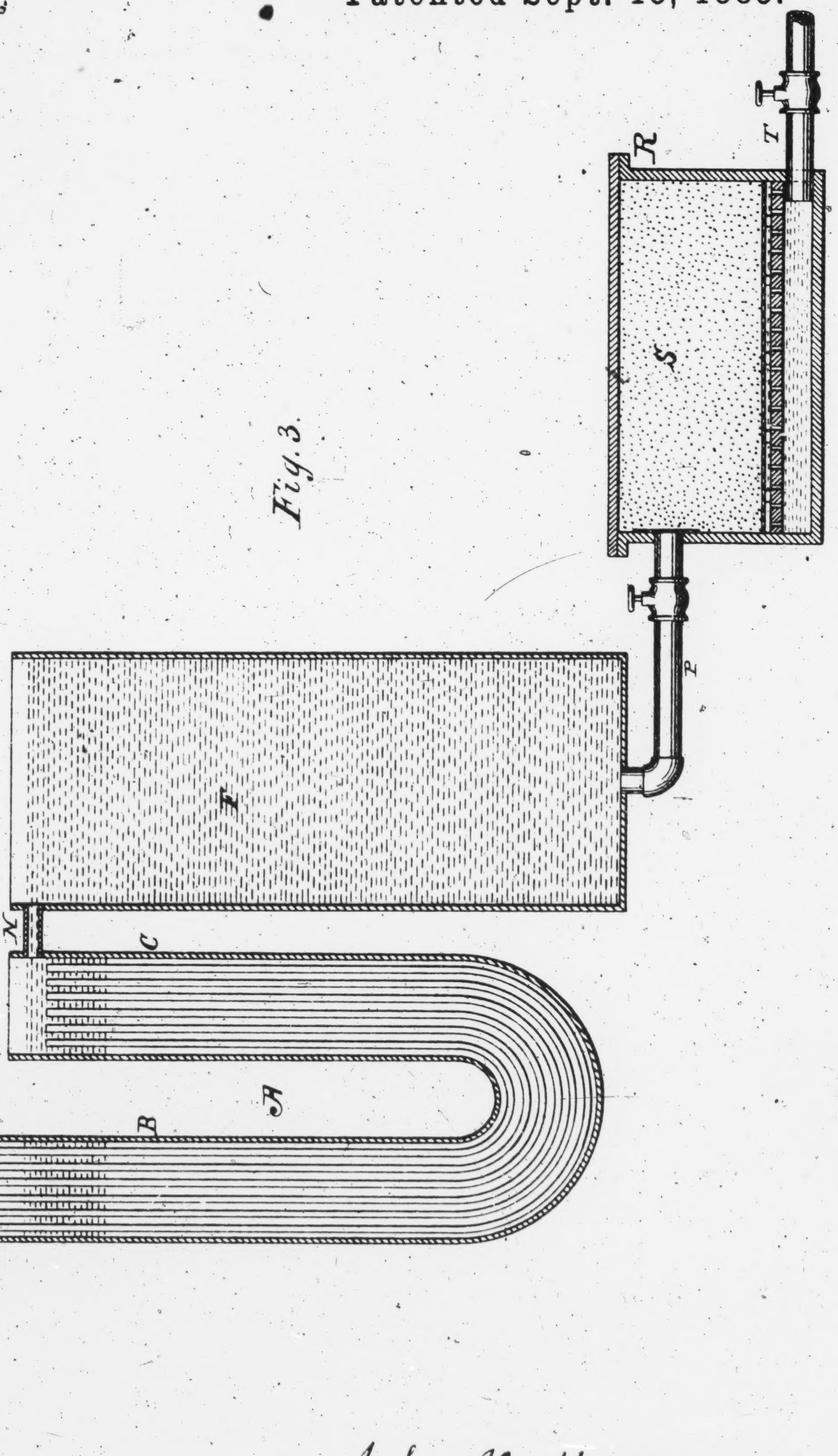
(No Model.) 3 Sheets—Sheet 2.

J. W. HYATT.

ART OF PURIFYING WATER.

No. 326,221. Patented Sept. 15, 1885.

Fig. 3.



WITNESSES

Edward Wolff

George Cook

John W. Hyatt INVENTOR

By his Attorney

Rowland Cox

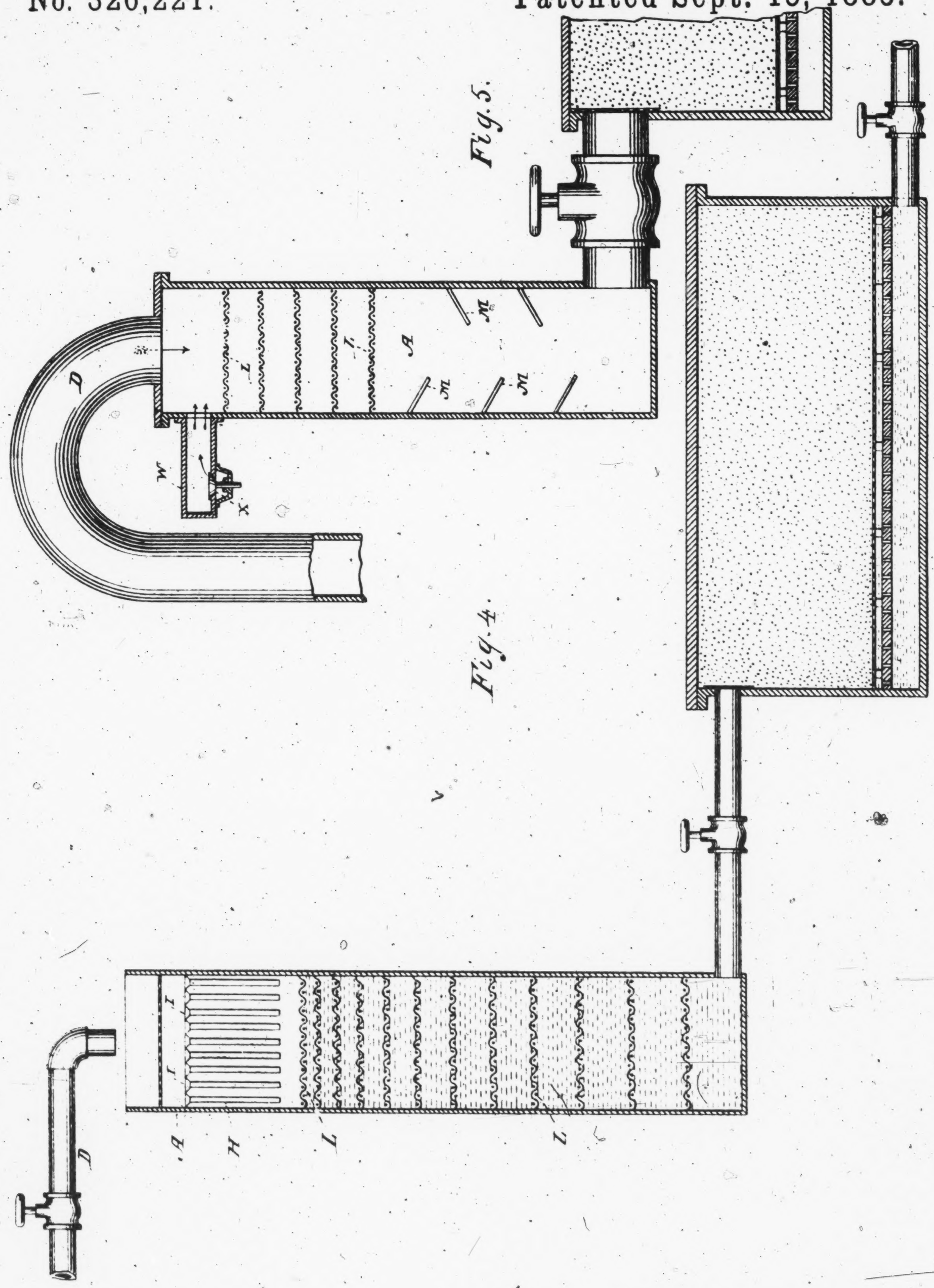
Defendant's Exhibit 44-1 2 App. 247

(No Model.) 3 Sheets—Sheet 3.

J. W. HYATT.

ART OF PURIFYING WATER.

No. 326,221. Patented Sept. 15, 1885.



WITNESSES

Edward Wolff

George Cook

John W. Hyatt INVENTOR

By his Attorney

Rowland Cox

Defendant's Exhibit 44-2

2 App. 253

(No Model.)

R. G. FERGUSON.

APPARATUS FOR MIXING LIQUIDS AND GASES.

No. 591,830. Patented Oct. 19, 1897.

FIG. 2.

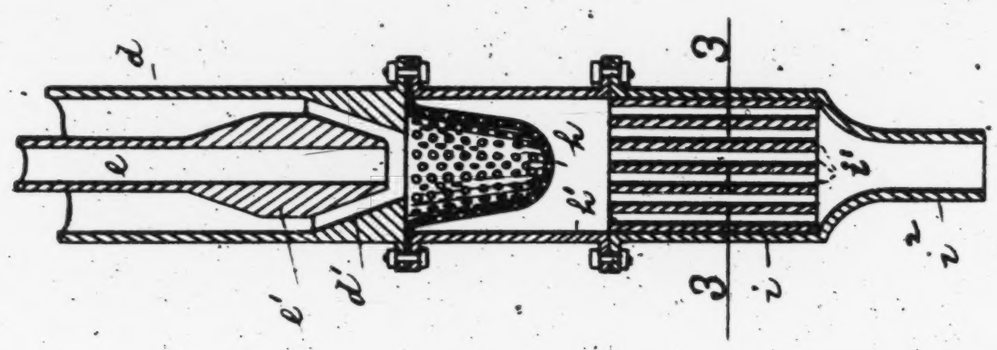


FIG. 1.

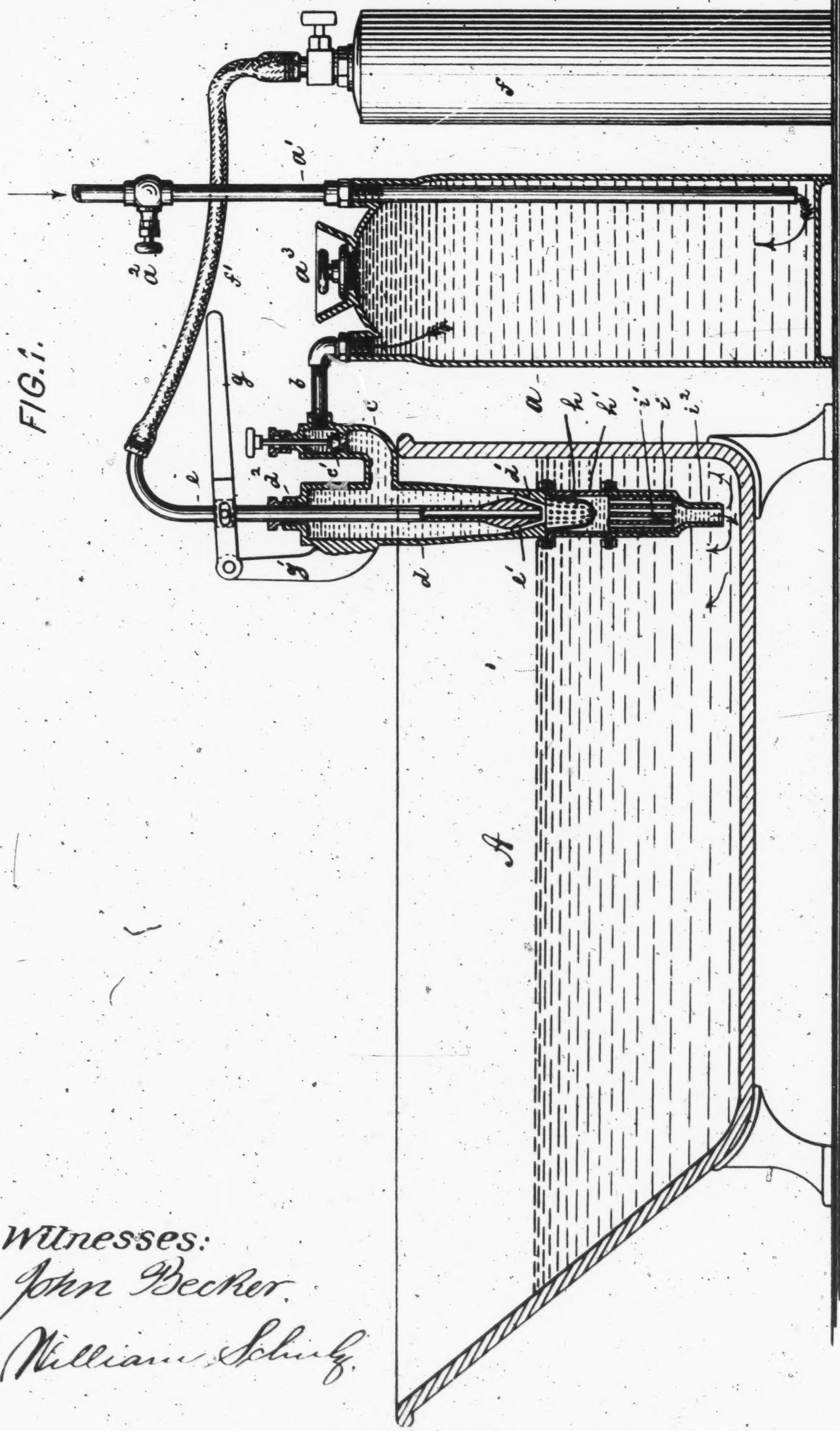
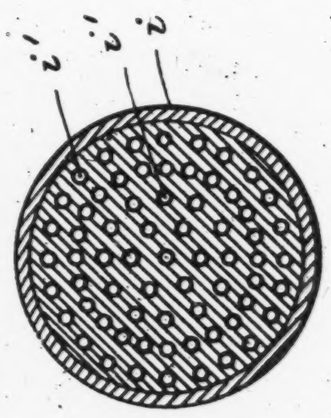


FIG. 3.



Witnesses:
John Becker.
William Schuly.

Inventor:
Robert G. Ferguson
by his attorneys
Roeder & Brieen

2 App. 257

Defendant's Exhibit 44-3

No. 881,548. PATENTED MAR. 10, 1908.

C. A. CLAFLIN.

AIR EXHAUSTING LIQUID SUPPLY APPARATUS.

APPLICATION FILED OCT. 9, 1907.

2 SHEETS—SHEET 1.

Fig. 3

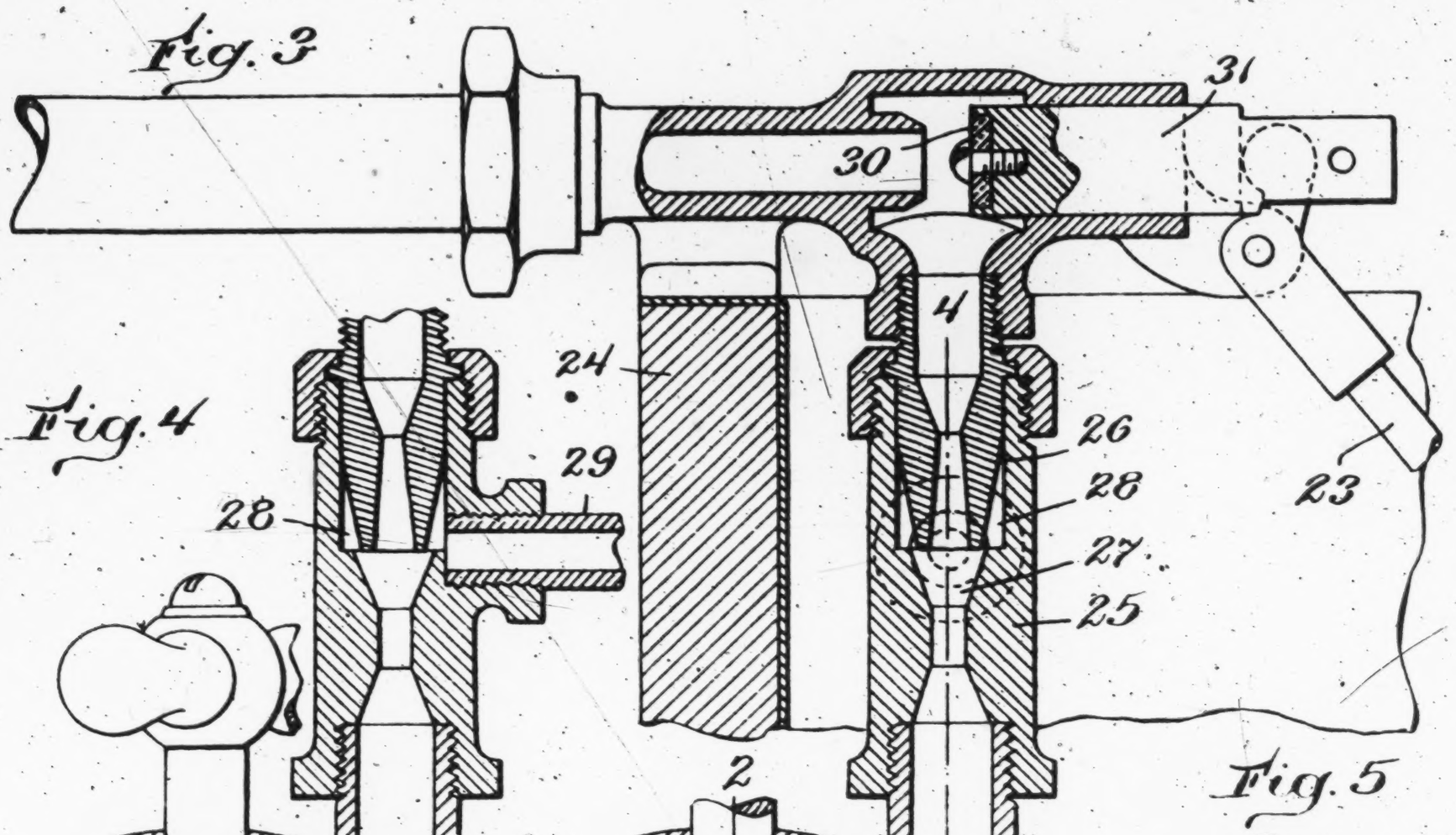


Fig. 4

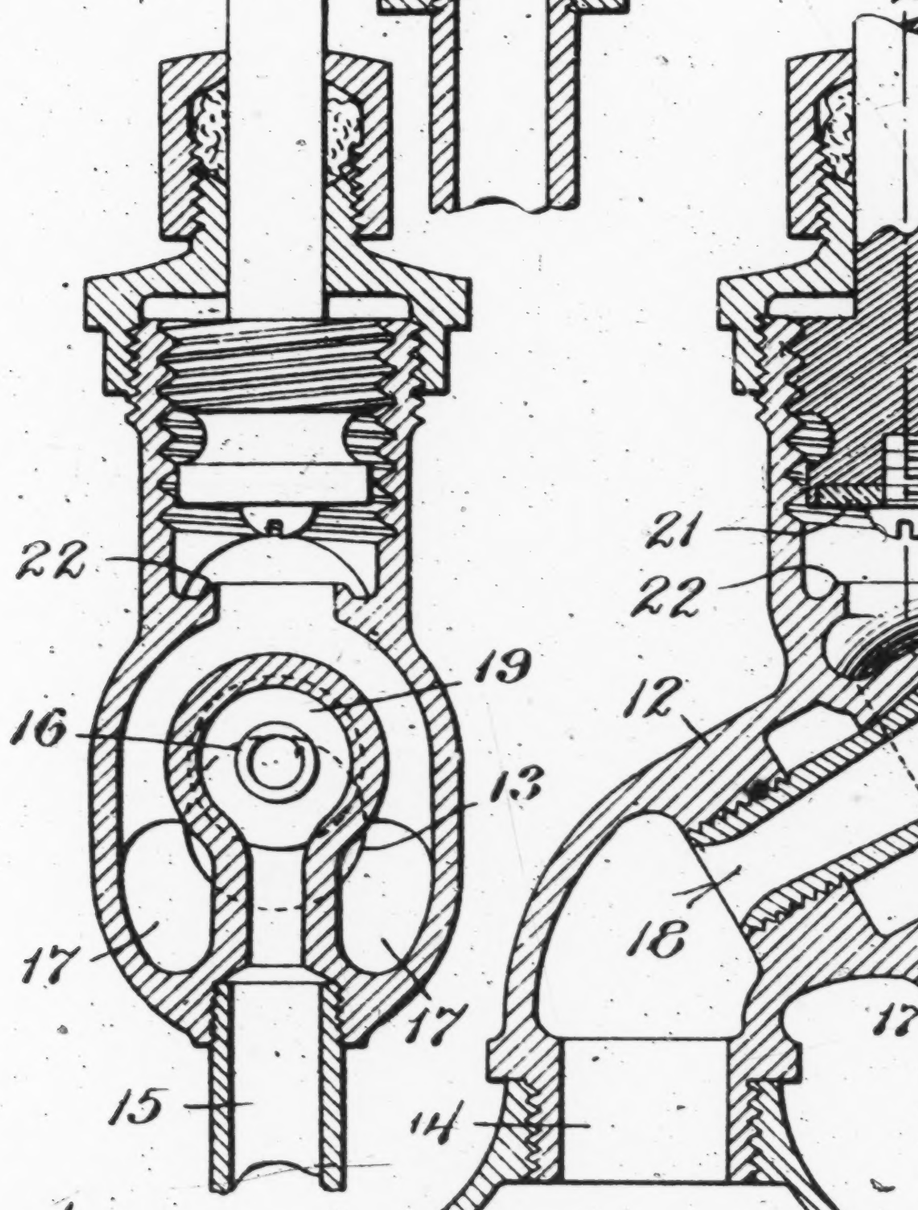


Fig. 2

Fig. 5

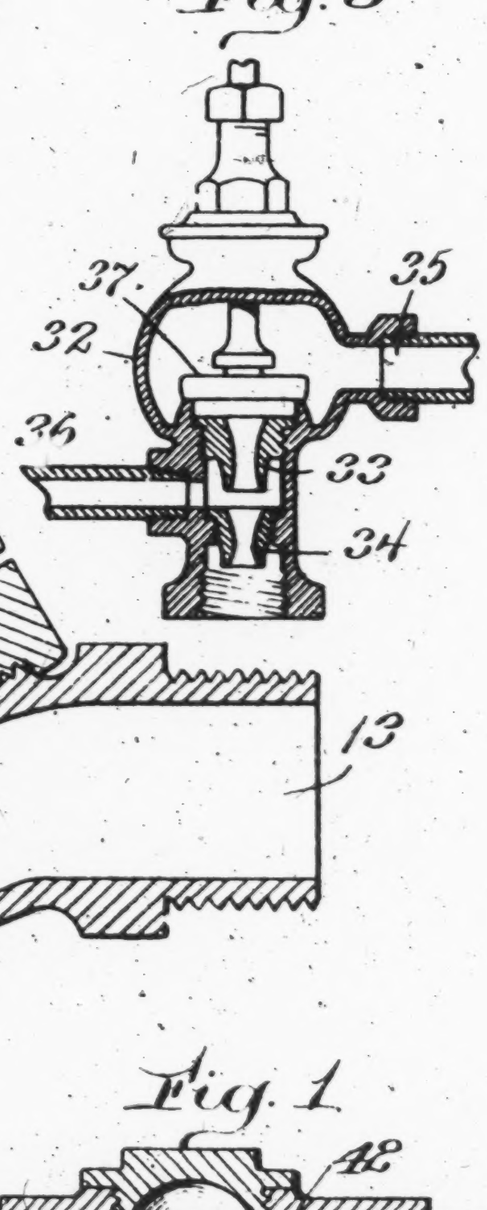
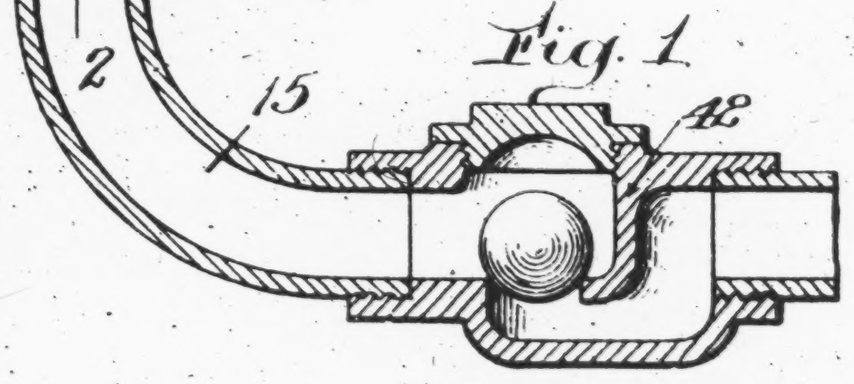


Fig. 1



Witnesses:
Peter F. Tazetta
E. Batchelder

Inventor:
Charles A. Claflin
by Wright Brown Quinby & May
Attorneys

Defendant's

[redacted]'s Exhibit 41

"A"

468687

INTERNATIONAL CONVENTION

PATENTS AND DESIGNS ACTS 1907-1932.

This specification is a copy of the specification at the date on which it became available for public inspection.

Form 3.

33884

6 DEC 1935

Complete Specification.

Fluid mixing devices in which one of the fluids is under pressure.

I, Elie Aghnides, a Greek subject, of 16, rue Capouillet, Brussels, Belgium, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

This invention relates tc a device for intimately mixing at least two fluids one of which is under pressure.

According to a general but non limitating case, atmospheric or surrounding air is intimately mixed to a circulating water column under pressure to obtain at the outlet of the device, a true water and air emulsion. The mixture thus obtained possesses remarkable qualities: the water thus charged with oxygen and carbon dioxide from the air, acquires an agreeable flavour, like water coming from a natural spring; this water is more digestive, it softens the skin and due to the simultaneous and automatic introduction of emulsed air and water realises with soap a very foamy emulsion which means better washing and a serious economy of soap and time, for instance when washing clothes. The enriching of the water in oxygen and carbon dioxide confers to the water a higher oxidising power and realizes an ionisation of the water which renders it more active.

Another practical application consists for instance in drawing off beer. Repeated experiments have proved that beer drawn off by means of carbon dioxide under pressure and compelled to run through the device according to the invention to be intimately mixed with the surrounding air, acquires a better taste and a finer appearance, the foam being more resistant.

This invention comprises all the cases in which one or more fluids (gas or liquid) have to be mixed to a circulating liquid column under pressure.

The device according to the invention comprises essentially, in combination, a cylindrical hollow body part which can be adapted to a fluid pipe under pressure, a passage in the wall of said body for entrance of another fluid in said body, by the aspiration caused by the passage of the fluid under pressure, and means below said passage, to force the fluid drawn in to mix with the fluid under pressure, the cross section of said body at said passage and the section immediately below said passage being larger than the total free section through which the fluid flows immediately above said passage.

According to an embodiment for mixing the surrounding air to a column of liquid under pressure, the passage or passages for the entrance of air may be formed by a ring of holes or slits in the walls of the tube or by an interruption in the wall, either with the part above said passage which contracts itself and eventually enters in the part below, or with the part below provided with a widening at its entrance, or still with the part above of a smaller diameter than the part below said passage.

The passage of the fluid under pressure, either at normal speed or at an artificially increased speed, creates a suction or call of air through said slits or holes and this air is drawn away by and mixed to the fluid under pressure in the pipe below said passage, provided to that end, with one or several dividing devices or baffles.

Defendant's
~~Plaintiff's~~ Exhibit 41

This process can be carried into effect in various manner and in certain cases or applications such as water softening devices it contributes to considerably simplify the plant.

In the drawings:

Fig. 1 is an axial cross-section of a water aerating device for a domestic water pipe.

Fig. 2 to 5 relate to various diagrammatic realisations.

Fig. 6 is a diagrammatic view of a domestic or other plant for treating fluids, for instance for water softening.

Fig. 7 is a cross-section at an enlarged scale, of the aerating device shown in figure 6.

Fig. 8 is a modified form of the device shown figure 6.

In figure 1, the numeral 1 indicates for instance a water pipe under pressure and 2 a tap of any type whatever. A tubular part 3 is fixed at the end of the tap; the connection can be made in any desired manner provided that is tight, and in the example this is realized by means of a special self tightening fitting 4 of a known kind.

The tubular part is provided and closed inside by means of a transversal partition 5 provided with holes 6 the object of which is to divide the current of water to increase the contacting surface between the water and the air; the total section or surface of the holes is smaller than the section through which the fluid flows at the end of the tap. Above the partition 5, in respect to the current of water, the side wall of tube 3 is provided with a ring of holes 7, the diameter of said ring being necessarily larger than the diameter of the total section of holes 6.

The manner in which the device works will be immediately understood.

Numeral 9 represents diagrammatically two perforated plates or any other dividing devices, to realize one or several chambers or spaces ensuring uniformity in the mixture before its exit.

The partition 5 may have a total section of passage equal to that of the pipe below (fig. 5), in respect to the current of water. In the same way, the holes 7 may be replaced by a complete interruption of the tubular wall as is the case in figures 2 to 5.

In figure 2, the upper pipe 20, which is larger than the pipe below, comes to an end in front of the latter in the form of a contracting-expanding part 21. In figure 3, the device is manifold and comprises several stepped air admission rings, and in figure 4 which corresponds to figure 3, the piping above and the piping below are jointed by a clip or by means of flanges 23 allowing the air to pass.

Referring to figures 6 and 7, 10 is an apparatus or tank of a known kind for softening the water which flows through it. This softening device can of course be of any desired type.

The use of those devices is becoming more and more diffused in domestic life. They are simply connected at the end of a distributing tap 11, of the non-softened water pipe 12.

Previously however, those plants had a drawback: the connection between softening tank 10 and service tap 11 was provided with a flexible rubber tube 14 and between said tube and tap 11 it is necessary to insert a three-way cock or tap, through which water coming from 11 was either sent through the softening device to come out at 15 or diverted through the three-way cock to be used without any softening.

Those three-way cock are of relatively costly manufacture and are not always tight. Moreover they cause movements of the rubber connection.

According to the invention, the three-way cock is done away with and replaced by a simple tap 16 directly fixed on the softening device 10.

The device shown figure 7 is connected to tap 11. Said device corresponds to the device shown figure 1, with the difference that the air slits or holes are formed in a circular chamber ending up in a nozzle 18.

In figure 7, the partition 5 is done away with according to a modified form. The converging or contracting pipe 17 opens out into a diverging or expanding pipe 19 which is connected to the flexible pipe 14, itself connected to tap 16.

Between the two pipes 17-19, there remains a free ring 13 in communication with the nozzle 18 to permit entrance of the air sucked in by the liquid column.

When the two tape 11 and 16 are open, the water flows through tank 10 where it arrives loaded with air. When tap 16 is shut, the water comes out at 18 in the non-softened state.

For the same application, the device of fig. 8 can be used, said device allowing as well to send aerated fluid to softening device 10 as to directly obtain aerated water when tap 16 is shut.

In the device shown fig. 8, in which the rubber connection 25 can be directly fixed to the end of tap 11, the feed water piping 26, opens out into chamber or space 27 which opens out, on the one hand, into nozzle 28 and which, on the other hand, is closed in respect of nozzle 29.

The first nozzle which is adapted to receive the flexible tube 14 is provided with a perforated partition 30 (which corresponds to the partition 5 of fig. 1) and with air entrance holes 31 which open out into nozzle 29.

This nozzle is of contracting-expanding form inside, with a ring of air entrance holes 32 at the junction of the two cones. The diverging or expanding portion of said nozzle is provided with dividing elements 33.

When the two taps 11 and 16 are open, the liquid tends to flow through the pipe of lesser resistance, i.e. pipe 14; as a result, a strong suction is realized at 29, the air flowing through holes 32 and from there through holes 31. If the tap 11 is open, the liquid comes out at 31 and 29, sucking in air through holes 32.

In the device shown figure 6, a very flexible rubber tube 34 can be provided at the nozzle 18, said tube being fixed to said nozzle, when for special reasons, it is not desirable that the fluid flowing through 10 should mix with air. Thanks to the vacuum at 18, resulting from the passage of fluid towards 14, said flexible tube closes itself automatically (see fig. 7).

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A device for intimately mixing at least two fluids, one of which circulates under pressure, comprising, in combination, a hollow cylindrical body connectable to a delivery pipe of fluid under pressure, a passage way in the wall of said body, connected to a space containing a fluid to be mixed to the fluid under pressure, and means down stream this passage, for obliging both fluids to mix together before leaving the hollow body, the cross-section aera of the body at the point where said passage is made, and the cross section aera of the body immediately down stream this passage, being both larger than the free streaming section for the fluid under pressure immediately up stream said passage.

2. A device according to claim 1, wherein said means comprises one or more baffles or perforated plates spaced apart.

3. A device according to claim 1 or 2, wherein said means is formed by an elongation of the body down stream the said passage.

Defendant's Exhibit 41

4. A device according to claim 1, characterised in that the stream of fluid under pressure is divided, immediately up stream the said passages for instance by a perforated cross wall.

5. For a device according to claim 1, a connector comprising a pasage-way through its wall, the part of this connector, up stream this passage way being adaptable to a delivery pipe of fluid under pressure, and the part of this connector down stream this passage way comprising a means for intimately mixing the fluid under pressure and the fluid aspirated by this fluid under pressure through said passage way, the cross-section aera of the connector at the point where the passage way is made, and the cross-section aera of the connector immediately down stream this passage, being both larger than the free streaming section for the fluid under pressure immediately up stream this passage.

6. A device according to claim 5, wherein the connector comprises a number of passage ways for fluids to be mixed with the fluid under pressure.

7. A device according to claim 3, wherein the passage way is connected to a duct.

8. A device according to claim 7, wherein the said duct is automatically closed by the depression caused by the fluid under pressure.

9. A device according to claim 7, wherein the said duct also comprises a passage way for a fluid to be mixed with the fluid under pressure, the parts of said duct up stream and down stream this passage way, having cross section aeras according to claim 1.

10. A device according to claims 7, 8 or 9, wherein the connector is connected through a tube and a tap with a tank.

Dated this 5th day of December 1935.

/s/ Hy. Fairbrother
Chartered Patent Agent,
30 & 32, Ludgate Hill, LONDON.

Note

Pages 239 and 240
are on Card 18.

"B"

(This part to be filled in at the Patent Office.)

Result of the search made under Sections 7 and 8 of the Patents Act, 1949, in connection with Application for Patent No. 468687.

Specifications or other publications cited as the result of the search made under Section 7

405316
360563
1170/15
16564/00
19654/93

Specifications cited as the result of the search made under Section 8

None

(Signatures)

NOTE.—Citations may be made during the examination of the specifications which are not relevant to the specification as accepted. Citations under Section 7 are completed before acceptance of the specification, but citations under Section 8 may be made subsequently.

Defendant's Exhibit 44-1 2 App. 249

UNITED STATES PATENT OFFICE.

JOHN W. HYATT, OF NEWARK, NEW JERSEY.

ART OF PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 326,221, dated September 15, 1885.

Application filed February 28, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. HYATT, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in the Art of Purifying Water, of which the following is a specification.

The invention relates to the art of purifying water; and it consists, essentially, in a novel apparatus whereby air may be intimately combined with the water for the purpose of oxidizing its impurities according to well-known principles, and the water then directly passed into the service-pipes of a city or house, or first into a filter, whereby all flocculent matter is arrested, and then into said service-pipes. The passage of the combined air and water through the bed of filtering material enhances the effect of the air upon the water, since the particles of the bed will finely subdivide the air and then combine and intermingle the subdivisions and again divide the air during its further passage through the filter. It is well understood that when air and water are intimately combined there will be a chemical action, the water absorbing the oxygen of the air and the impurities in the water being consumed or rendered inert. In this condition the materials remaining after the chemical action, while probably not injurious until further decomposition has taken place, are, to say the least, offensive to the eye. Whether or not the water and air will be brought into such intimate relation as to insure the chemical purification of the water thereby will depend upon the nature of the apparatus employed for effecting this purpose; and it is to be remarked that in the purification of water for large cities or for manufacturing districts it is essential that the apparatus be simple in construction and be capable of utilization without great expense as to the original construction as well as to its maintenance. The object of the present invention is, therefore, to produce an apparatus whereby, in a continuous process, water may be rendered chemically pure by its union with air and the inert material remaining in the water be removed, the apparatus being simple in construction and uniform and effective in its operation, and maintainable at a minimum expense.

The invention will be fully described in the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a central vertical longitudinal section of an apparatus embodying that part of my invention which relates to the union of the water and air. Fig. 2 is an enlarged vertical section of the upper end of the pipe A, illustrating the manner of subdividing the water and utilizing the subdivisions for conveying air into the tubes. Fig. 3 is a central vertical longitudinal section of the apparatus, illustrated as being in connection with an elevated reservoir and discharging into a filter, whereby the impurities in the water which have been rendered inert are arrested prior to the delivery of the water into the service-pipes of the city; and Figs. 4 and 5 are central vertical longitudinal sections of slightly-modified forms of the apparatus involving the invention sought to be protected hereby.

In the accompanying drawings, A designates the pipe or receptacle in which the water and air are combined. It consists of the branches lettered B and C, respectively, connected by a short bend, the upper end of both branches being open, and the mouth of the branch lettered B being elevated above the horizontal plane of the upper end of the branch lettered C. The pipe or receptacle A will contain suitable devices for thoroughly commingling the air and water, the pressure of the air being one atmosphere at the inlet and an increased number of atmospheres at the point of connection of the branches B C, at the upper end of the latter of which the unabsorbed air is discharged at a pressure of one atmosphere.

The devices arranged within the pipe or receptacle A for effecting the chemical union of the air and water may vary in their construction to a considerable extent, the main purpose being to keep the water in a constant state of agitation in connection with the air, and to prevent the escape of the latter until its desired union with the water has been effected. There are some features of special advantage in the construction I illustrate in the drawings for effecting the union of the air and water independent of the general novel features of the apparatus as a whole.

In the upper end of the branch B of the pipe or receptacle A, I illustrate an arrangement of devices in which I utilize in part the principle of the well-known Sprengel air-pump, and by means of which the stream of water supplied through the pipe D, leading from the pump E, is subdivided, and the subdivisions caused to pass through and draw air into tubes, in which there will be a partial union of the air and water prior to their discharge into the lower parts of the receptacle or pipe A, where there will be a further chemical union, owing to the constant agitation of the water and air during the passage of the former to the receiving tank or reservoir F. The water supplied by the pipe D is discharged upon the conical screen G, whereby it is subdivided or articulated, and passes into the series of tubes or Sprengel air-pumps H, arranged directly below the screen G, each of said tubes or pumps having a conically-shaped inlet, I, as illustrated more clearly in the enlarged sectional view denominated Fig. 2.

Below the tubes H (see Fig. 1) is arranged upon a grating, J, a bed of gravel, broken stone, or cobble-stones, K, and below this bed of stone is provided a series of screens, L, beyond which the sides of the pipe or receptacle A are furnished with a series of deflecting-plates, M.

While I have illustrated in the pipe A a bed of stone, K, screens L, and deflecting-plates M, it is not to be understood that all of these devices are to be used simultaneously, although they may be so employed, if desired.

I have the stone, screens, and blades M as illustrating the varied means which may be employed to keep the water in a constant state of agitation, so as to effectually accomplish the union of the air and water. It will be found entirely practicable to employ the bed of gravel or stone K, extending throughout the greater portion of the receptacle A or the screens L, the plates M being omitted. I have used the screens L (as well as the bed of stone) in this manner with entirely satisfactory results, and the apparatus thus constructed has the further advantages of being simple and inexpensive. The water passing into the tubes or pumps H will draw the air with it, as aforesaid, and the air and water passing through and around the stones K will be thoroughly intermingled and combined, and the pressure of the air will increase as the water descends to the lower level of the pipe or receptacle A, so that while the air enters the branch B at a pressure of one atmosphere it will increase as the water and air are forced along through the pipe toward the connection N, leading into the reservoir F, the air finally escaping at the upper end of the branch C at a pressure of one atmosphere.

The water may be led from the tank F for use by means of the delivery-pipe P, having a gate-valve, Q, or if it is desired to remove the flocculent inert substance also from the water the pipe P should lead to a filter, R, of any suitable construction, as shown in Fig. 3, in which S denotes a bed of granular filtering material and T a delivery-pipe. It is certainly desirable, and in many instances necessary, to remove the inert material, especially when the water is to be employed for manufacturing and domestic purposes. It is to be observed that the process is continuous from the pipe D to the delivery-pipe T, from which the water passes in a purified condition.

The pump E will not be necessary, of course, where the source of supply is from an elevated reservoir, either natural or artificial, as shown in Fig. 3, wherein V designates the supply for unfiltered and unaerated water. In Fig. 3 I have shown also the tube H as extending almost throughout the pipe or receptacle A, since this construction will serve to effectually combine the air with the subdivided streams of water, the air being drawn into the tubes H by and carried along with the water.

In the apparatus illustrated in Fig. 4 I utilize the screens L exclusively for subdividing and commingling the air and water, and omit one branch of the receptacle A. This form of apparatus may be connected directly with the filter, as illustrated in said Fig 4. It is not necessary in all cases to use a receptacle, A, consisting of two branches, since the only purpose of the receptacle is to receive the air and water, and to thoroughly combine and intermingle them so that the chemical action may be as complete as possible.

Fig. 5 shows another modification of my filter, the receptacle A having a closed top, and provided with the screens L and deflecting-plates M. In the top fits one end of the supply-pipe D, which is preferably about one-half of the diameter of the receptacle A. One side of this receptacle A is provided with a small pipe, W, the outer end thereof being closed, and provided on its under side with a valve, X, opening upwardly within the pipe. As the water flows down through the receptacle, taking the air with it, a partial vacuum is created in the pipe W, and the valve X formed therein allows the air to pass up through it to be commingled with the flowing water.

I am aware that in the art of filtration air has been combined with the water for the purpose of aerating it. An apparatus for accomplishing this result is illustrated in Letters Patent No. 229,774, granted to Daniel C. Otis on the 6th day of July, 1880, now owned by my assignee. Other patents on filtering apparatus have been issued in which means have been devised for aerating the liquid.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An apparatus for purifying water, consisting, essentially, of a receptacle constructed substantially as described, and a supply-pipe leading therein, a filter separated from but in communication with said receptacle, and

Note

Page 242 is blank;
Page 243 is on Card 18;
Page 244 is blank;
Page 245 is on Card 18;
Page 246 is blank;
Page 247 is on Card 18;
Page 248 is blank.

adapted to receive the water after passing through the latter, and agitators located within the receptacle, for agitating and commingling the air and water before passing from the receptacle, and prior to its entrance into the filter, substantially as set forth.

2. In an apparatus for purifying water by aeration, a receptacle having at its open upper end a screen for articulating the stream of unpurified water, and a series of Sprengel air-pumps below said screen to receive the articulated divisions of the stream, in combination with a water-supply, substantially as set forth.

3. In an apparatus for purifying water by aeration, the combination, with a water-supply, of a receptacle open at its upper end to admit air, a series of Sprengel air-pumps located within the receptacle below the inlet for air and water, agitators below said pumps for keeping in agitation, and thus facilitating the union of the air and water, and an outlet from the receptacle, substantially as set forth.

4. In an apparatus for purifying water by aeration, the combination, with a receptacle open at its upper end to admit air, of a supply-pipe leading therein, a series of Sprengel air-pumps located within the receptacle and below the air and water supply, and a screen or its equivalent below the pumps, substantially as and for the purposes set forth.

5. In an apparatus for purifying water, the combination, with a receptacle, an air-supply and a supply-pipe for water at its upper end, of a series of Sprengel air-pumps located within the receptacle below the air and water supply, agitators for disturbing the flow of the water and air below said pumps, and a filter in communication with said receptacle, substantially as set forth.

6. In an apparatus for purifying water by aeration, the combination, with the receptacle A, open to admit air, of a series of Sprengel air-pumps, H, located therein, and having inverted-cone-shaped mouths I, and a water-supply above said pumps, substantially as set forth.

7. In an apparatus for purifying water by aeration, the combination of a water-supply with a receptacle, A, open at its receiving end to admit air, and composed of branches B C, a screen, G, for articulating the inflowing current of water, a series of Sprengel air-pumps, H, below said screen, a bed of broken stone or gravel below said pumps, and a delivery, substantially as set forth.

8. An apparatus for purifying water, consisting of the receptacle A, composed of branches B C, the former being taller than the latter, and both having their upper ends open, a water-supply leading to the receptacle, and screens within the receptacle for subdividing the water and air, thus facilitating their union, and a filter removed from but in communication with said receptacle, substantially as set forth.

9. In an apparatus for purifying water, the receptacle A, composed of the branches B C, the former, being open to admit air, taller than the latter and containing the articulating, screen G, and Sprengel air-pumps H, in combination with the supply-pipe D, a filter containing a bed of filtering material, and a connection between the filter and branch C, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 29th day of January, A. D. 1885.

JOHN W. HYATT.

Witnesses:
GEORGE COOK,
HERMAN GUSTOW.

Defendant's Exhibit 44-2 2 Apps 255

UNITED STATES PATENT OFFICE.

ROBERT G. FERGUSON, OF LAKEWOOD, NEW JERSEY, ASSIGNOR OF ONE-HALF TO ABRAHAM M. ELKUS, OF NEW YORK, N. Y.

APPARATUS FOR MIXING LIQUIDS AND GASES.

SPECIFICATION forming part of Letters Patent No. 591,830, dated October 19, 1897.

Application filed January 22, 1897. Serial No. 620,228. (No model.)

To all whom it may concern:

Be it known that I, ROBERT G. FERGUSON, a citizen of the United States, and a resident of Lakewood, in the county of Ocean and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Mixing Liquids with Gases, of which the following is a specification.

This invention relates to an apparatus so constructed that it will charge liquids with gases in such a manner that the latter will be finely subdivided and will be suspended in the liquid in the form of small bubbles, that will be slow to escape.

The invention is well adapted to be applied for the production of effervescent or "Nauheim" baths in which a saline liquid is charged with carbonic-acid gas, but it is clear that the invention may be applied to other purposes.

In the accompanying drawings, Figure 1 is a longitudinal section, partly in side view, of my improved apparatus, showing it applied to a bath. Fig. 2 is a detail longitudinal section through the injector; and Fig. 3, a cross-section on line 3 3, Fig. 2.

The letter *a* represents a fixed or portable vessel designed for the reception of a suitable liquid, such as water. The vessel *a* may communicate with the water-main by a pipe *a'*, having valve a^2, and extending to within a short distance of the bottom of the vessel. Suitable chemicals, such as salts, may be introduced into the vessel *a*, through a hand-hole a^3, which will be thoroughly dissolved by the water admitted by pipe *a'*. Near its upper end the vessel *a* communicates by pipe *b* with a valve-chamber *c*, which in turn communicates with the outer tube *d* of an injector or mixer. A valve *c'*, in chamber *c*, is adapted to control or check the flow of liquid.

Through the outer or liquid tube *d* there extends centrally the inner or gas tube *e*, which is connected with a gas-cylinder *f* by a flexible hose *f'*. The lower end of tube *e* terminates in a conical head or valve *e'*, adapted to engage a conical valve-seat *d'*, in which the tube *d* terminates. The tube *e* is longitudinally adjustable, so as to increase or diminish the size of the liquid-passage formed between the parts *d' e'*, and to thus regulate easily the relative proportions of admixed liquid and gas.

To permit the vertical adjustment of tube *e*, I have shown it connected to a hand-lever *g*, fulcrumed to a fixed support *g'*, while a stuffing-box d^2 holds the tube at any elevation at which it may be set.

To the lower end of tube *d* there is attached a foraminated thimble *h*, through the small perforations of which the admixed gas and liquid are ejected in the form of a fine spray. This spray is collected in a chamber formed by a surrounding tube *h'*, and thence flows downward through a number of parallel upright ducts or channels *i'* of a perforated nozzle *i*, to be finally discharged into a bath-tub A or other receptacle through nipple i^2.

By the particular construction of the injector the gas is divided into small bubbles, which will be slow to rise through the saturated body of liquid within tub A, so that an effervescent bath is obtained which permits a prolonged use without loss of the original properties of the admixture. The injector furthermore so breaks the force of the current that the charged liquid will escape into the tub through the nipple in a quiet stream, and not in the form of a violent current. Finally the apparatus enables a constant or unceasing renewal of the admixture in its full strength for any desired period of time.

It is clear that the invention may be applied to different purposes from the one specified, it being adapted generally for the admixture of volatile, semivolatile, or gaseous substances or of solid or semisolid substances (under pressure) with liquids.

What I claim is—

1. In a mixing apparatus the combination of an outer tube with an inner tube, a perforated thimble at the bottom of the outer tube, a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

2. In a mixing apparatus the combination of an outer tube having a valve-seat with an inner longitudinally-adjustable tube having a head adapted to engage said valve-seat, means for operating the inner tube, a perforated thimble at the bottom of the outer tube,

a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

3. In a mixing apparatus the combination of a vessel with a liquid-feed pipe extending into the same to within a short distance of its bottom, an outer tube having a valve-seat and connected to said vessel, a valve between vessel and tube, a gas-cylinder, a longitudinally-movable headed inner tube connected thereto, means for operating the inner tube, a perforated thimble at the bottom of the outer tube, a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

Signed at Lakewood, in the county of Ocean and State of New Jersey, this 19th day of January, A. D. 1897.

ROBERT G. FERGUSON.

Witnesses:
BENJ. H. FIELDER, Jr.,
F. W. TODD.

Defendant's Exhibit 44-3

UNITED STATES PATENT OFFICE.

CHARLES A. CLAFLIN, OF MEDFORD, MASSACHUSETTS.

AIR-EXHAUSTING LIQUID-SUPPLY APPARATUS.

No. 691,848. Specification of Letters Patent. Patented March 10, 1902.

Application filed October 9, 1897. Serial No. 655,055.

To all whom it may concern:

Be it known that I, CHARLES A. CLAFLIN, of Medford, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Air-Exhausting Liquid-Supply Apparatus, of which the following is a specification.

This invention has for its object to enable a liquid supplying faucet to perform the additional function of exhausting air from a vacuum chamber or element of an apparatus for utilizing a vacuum or partial vacuum.

The invention is embodied in a cock or faucet having a liquid inlet and outlet, an intermediate air inlet, means for causing the flow of liquid through the casing to induce an inflow of air through the air inlet, means for controlling the flow of liquid through the casing and means for automatically closing the air inlet when the flow of liquid and the flow of air induced thereby cease, so that the partial vacuum produced by the operation of the faucet in a vacuum tank with which the air inlet is connected, may be maintained. When the faucet is performing its ordinary function of supplying liquid, a flow of air into the casing is induced by the flow of liquid therethrough, the air and liquid passing together from the outlet of the casing.

The invention is also embodied in an apparatus which includes a plurality of faucets of the character above mentioned, and means connected with the air inlets of the several faucets for utilizing the vacuum caused by the action of the faucets or either of them.

The faucets may be the several water supply faucets used in a house, and the vacuum utilizing means may include a vacuum tank suitably connected with a steam heating system to maintain heat in the radiators of the heating system. By thus utilizing water supply faucets, such as those used in connection with kitchen sinks, lavatories, flushing tanks, etc., the employment of separate and special vacuum producing means or apparatus in connection with a steam heating system, is rendered unnecessary, it being possible to produce by a system of said faucets in a building and by the ordinary flow of water through such faucets, a vacuum as high as 20", and of greater or less volume according to the water pressure and the quantity of water drawn in a given time.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a sectional view of one form of air exhausting faucet embodying my invention. Fig. 2 represents a section on line 2—2 of Fig. 1. Fig. 3 represents a sectional view of a form of faucet embodying my invention, suitable for use as a so-called ball cock, in connection with a water closet flushing tank. Fig. 4 represents a section on line 4—4 of Fig. 3. Fig. 5 represents a sectional view of another type of faucet embodying my invention. Fig. 6 represents in elevation an air exhausting liquid supply apparatus, which includes a plurality of the said faucets and a vacuum tank connected therewith and with a steam heating system.

The same letters of reference indicate the same parts in all the figures.

For convenience I will use the term "faucet" as characterizing each form of liquid controlling device shown in the drawings, whether the same be for the supply of water at a kitchen sink, wash bowl, etc., as shown in Figs. 1 and 2, or for supplying a flushing tank, as shown in Figs. 3 and 4, or for controlling the flow of liquid through a conduit, as shown in Fig. 5.

Referring first to Figs. 1 and 2, 12 represents a casing having a liquid inlet 13, an outlet 14, and an air inlet 15 located between the inlet 13 and outlet 14. The casing is provided between the liquid inlet and the outlet with means for causing the flow of liquid through the casing to induce an inflow of air through the air inlet 15, the air mingling with the liquid, and flowing therewith through the outlet 14. The said means in the best embodiment of my invention of which I am at present aware, comprise a jet-forming nozzle 16 communicating with the inlet 13 through branched passages 17, and a combining nozzle 18 separated from the jet-forming nozzle 16 by an air space 19 which communicates with the air inlet 15. The nozzles 16 and 18 are tapered, as shown in Fig. 1, and each is preferably detachably secured to the faucet casing 12 by a screw-thread connection, so that the nozzles may be removed whenever this is desirable. The relative arrangement of the nozzles 16 and 18 and air chamber 19 is such that a jet of water formed by the nozzle 16, is projected across the air chamber into the combining nozzle, and induces a flow of air through the inlet

Defendant's Exhibit 44-3

15 into the air chamber 19, the air mingling with the jet of water in the combining nozzle, and passing out with the water through the outlet 14. The valve 21 which controls the flow of liquid through the faucet, is adapted to close upon a seat 22, which is located between the liquid inlet 13 and jet-forming nozzle 16, so that when the valve is closed, the flow of liquid through the nozzle 16 ceases.

It will be seen that whenever the faucet is performing its ordinary function, an inflow of air is induced through the air inlet 15, this inflow ceasing when the faucet is closed. In Figs. 3 and 4 I show a faucet of the character ordinarily known as a ball cock, the valve of the faucet being opened and closed by the downward and upward movements of a float lever 23 in a flushing tank 24, such as is commonly used in water closets. In this embodiment of the invention, 25 is the casing of the faucet, 26 is the jet-forming nozzle, 27 is the combining nozzle, 28 is the air chamber between the nozzles 26 and 27, and 29 is the air inlet communicating with the air chamber 28. The valve 30 which controls the flow of liquid through the faucet, is mounted on a plunger 31 connected with the float lever 23 in the usual or any suitable manner. When the valve is opened the flow of liquid through the faucet into the flushing tank, induces a flow of air through the inlet 29.

In Fig. 5 I show a faucet adapted to serve as a shut-off in a water pipe or conduit, and having a casing 32 containing a jet-forming nozzle 33 and a combining nozzle 34, said casing having a liquid inlet 35, an air inlet 36 and a shut-off valve 37 between the liquid inlet and the jet-forming nozzle. The operation of this type of faucet is the same as that of the others.

In Fig. 6 I show a system which includes the two faucets shown in Figs. 1 and 3, a vacuum chamber 38 which is connected by a pipe 39 with the air inlets 15 and 29 of said faucets, radiators 40 having suitable pipe connections with the vacuum chamber, said radiators forming part of a steam heating system, which includes a boiler 41 and suitable steam conducting pipes connecting the boiler with the radiators. The vacuum tank 38 may be suitably connected with the radiators, the steam piping and the boiler. Suitable check valves 42 are employed to prevent a back flow of air to the vacuum chamber when the faucets are not in operation.

The vacuum faucets may, if desired, be connected directly to the radiators, suitable check valves and thermostatic valves being employed between the faucets and the radiators to prevent air from returning to the radiators after having been withdrawn therefrom by the action of the faucets, and also to prevent steam from flowing through the air pipes to the faucets after steam generation and circulation have commenced.

The air inlet 15 in each embodiment of my invention, constitutes a part of a conduit adapted to be connected with a vacuum chamber (which may be a steam radiator), the operation of the faucet inducing a flow of air from said chamber. The said conduit in each case is provided with means such as a check valve 42, whereby it may be closed to prevent a back flow of air to said chamber when the operation of the faucet ceases.

It will be understood that the amount of vacuum produced is dependent on the number of faucets employed and the extent to which the faucets are used.

It will be seen that the faucets may be used only for the supply of liquid when a vacuum production is not desired.

My invention above described may be utilized for other purposes, and is not limited to use in connection with a heating system.

I claim:

1. An air-exhausting apparatus, comprising a faucet or cock casing having a liquid inlet, an outlet, an intermediate air inlet, means for causing the flow of liquid through said casing to induce an inflow of air through the air inlet, and a liquid-controlling valve adapted to shut off the liquid between the liquid inlet and the air inlet, the said air inlet forming a part of an air conduit adapted for connection with a vacuum chamber, and means for closing said conduit to prevent a back flow of air therethrough.

2. An air-exhausting apparatus, comprising a faucet or cock casing having a liquid inlet, an outlet, an intermediate air inlet, means for causing the flow of liquid through said casing to induce an inflow of air through the air inlet, and a liquid-controlling valve adapted to shut off the liquid between the liquid inlet and the air inlet, the said air inlet forming a part of an air conduit adapted for connection with a vacuum chamber, and a vacuum-maintaining check valve controlling the air in said conduit.

3. An air-exhausting faucet or cock, comprising a casing having a liquid inlet, an outlet, a jet-forming nozzle communicating with the liquid inlet, a combining nozzle between the outlet and the jet-forming nozzle, and separated from the latter by an air space, an air inlet communicating with said air space, and a liquid-controlling valve between the jet-forming nozzle and the liquid inlet, the relative arrangement of said nozzles and air space being such that a jet of liquid is projected across the air space into the combining nozzle, and induces an inflow of air through the air inlet.

4. An air-exhausting liquid-supply apparatus, comprising a plurality of faucets, each having a liquid inlet, an outlet, an intermediate air inlet, means for causing the

flow of liquid through the casing to induce an inflow of air through the air inlet, and means for shutting off the liquid between the liquid and air inlets, a vacuum tank, pipe connections between said tank and the several faucets, and vacuum-maintaining check valves controlling said air inlets.

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHARLES A. CLAFLIN.

Witnesses:
EDWARD E. PARKER,
ORLANDO F. DE SHON.

Note

Page 252 is blank;
Page 253 is on Card 18;
Page 254 is blank.

Note

Page 857 is on Card 18;
Page 858 is blank;
Page 859 is on Card 20;
Page 860 is blank.

Note

Page 264 is blank;
Page 265 is on Card 20;
Page 266 is blank;
Page 267 is on Card 20;
Page 268 is blank.

Defendant's Exhibit 44-4

UNITED STATES PATENT OFFICE.

NELSON A. LOCKWOOD, OF OGDEN, UTAH.

APPARATUS FOR THE GASEOUS TREATMENT OF SACCHARINE JUICES.

1,195,044. Specification of Letters Patent. Patented Aug. 15, 1916.

Application filed February 9, 1916. Serial No. 77,934.

To all whom it may concern:

Be it known that I, NELSON A. LOCKWOOD, a citizen of the United States, residing at Ogden, in the county of Weber and State of Utah, have invented certain new and useful Improvements in Apparatus for the Gaseous Treatment of Saccharine Juices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in apparatus for the gaseous treatment of saccharine juices.

I am aware that, in the manufacture of cane sugar, in addition to treating the expressed raw cane juice with lime for defecation purposes, for a long time it has been customary to sulfur the raw juice, by impregnating the same with sulfur dioxid, for the purpose of decolorizing or bleaching the juice. Similarly, in the treatment of the raw diffusion juice from the sugar beet, in addition to the introduction of carbon dioxid, for the purpose of carbonation or causing the precipitation of the lime salts, employed to remove impurities, it has also been a common practice to sulfur the solution.

My invention, therefore, does not aim at the broad idea of treating saccharine juices with any particular gas or gases, but is directed to an improved apparatus for making that treatment more positive and effective.

The main principle on which prior devices of this character have operated has been to have the raw juice sprayed or caused to flow downwardly, in thin sheets or ribbon-like streams, over alternately disposed shelves, oppositely located in a closed receptacle, commonly known as sulfur boxes, while the gases were caused to flow upwardly therethrough and were partially absorbed by the down-coming juice. This, however, produced more of a bodily contact of the gases with the surface of the juice, and while absorption resulted, it is obvious that the more intimately the treating gas or gases are caused to commingle with the juice, the more effective will be the impregnation and absorption.

The primary object of my invention, therefore, is to improve the conditions or methods heretofore employed, by causing the gases to come into more direct or intimate molecular contact with the particles of the mass of juice, rather than by surface contact and indirect partial absorption.

In the accomplishment of this end, my invention consists broadly in injecting the raw juice, preferably under a pumping pressure, in the form of spray or jets, into the apparatus, and simultaneously sucking in the treating gas or gases into intermingled or entrained relation therewith, by aspiratory action of the injecting means, at the entrance of the apparatus, causing an initial commingling of the juice and the gases. The juice and entrained gases are then conducted through a down-pipe or conduit of suitable length, to a retarding chamber, having a series of alternating, oppositely disposed baffle plates or barriers, forming a tortuous passageway through the retarding chamber, and diminishing the velocity of the ascending liquid, as it rises in the retarder toward a discharge outlet at the upper end thereof. The gases naturally act on the juice during the passage through the down-pipe, and further react on the liquid in the retarder, resulting in more effective clarification and bleaching.

The methods of filtering out the remaining impurities from the clear juice, evaporation, crystallization, etc., may obviously be accomplished by the usual apparatus now employed for such purposes.

From a manufactural standpoint, another object of the invention is to produce such an apparatus, which is not only simple in construction and operation, but which is also durable, efficient in action, and comparatively inexpensive to manufacture.

For the purpose of a full disclosure, reference is had to the accompanying drawings illustrating a practical embodiment of the invention, which will be described in detail in the following specification, and the particular features of novelty of which will be more particularly pointed out in the appended claims.

Referring to the drawings, in which like characters designate the same parts in the several views:—Figure 1, is a vertical sectional view through the outer receiving tank, my improved apparatus being shown in elevation, and a portion of the receiving tank, and the down-pipe conduit being partially broken away. Fig. 2, is a longitudinal sectional view of the upper portion of my apparatus, showing the disposition of the in-

jector nozzle and cones, within the gas receiving casing or commingling chamber. Fig. 3, is a similar view of the lower portion of my apparatus, showing the disposition of the baffling plates or barriers within the retarding tank, and the outer receiving tank being omitted, and Fig. 4, is a transverse sectional view through the injector nozzle, taken on the line 4 of Fig. 2, and looking downwardly in the direction of the arrow.

1 designates a cylindrical casing, functioning as a mixing chamber, having a flanged open bottom 2 and top 3, the upper end of the casing being provided with inlets for the treating gases, the inlet for the sulfurous acid gas (SO_2) being indicated at 4, and the inlet for the carbonic acid gas (CO_2) being indicated at 5.

The casing 1 is provided with a flanged plate or head 6, snugly seated within the aperture 3 of the casing, its flanged rim portion 7 resting on top of the casing and securely bolted thereto to form a tight top closure for the mixing chamber. The central portion of the cover 6 is also apertured as at 8, and may be provided with the circular boss 9, on which is seated the flanged top 10 of an aspirator or injector 11, projecting through the aperture 8, into the mixing chamber, and which injector may have an integral bottom plate 12, provided with a plurality of jet orifices or nozzles 13, preferably of conical contour, and so disposed around the bottom plate 12 as to project the incoming raw juice, in the form of a spray or a series of jets, against the inner surface wall of the first hollow conical member hereinafter referred to.

Seated on the flange 10 of the injector is the flange 14 of the raw juice inlet pipe 15, leading from the source of raw juice supply (not shown) and registering with the hollow interior of the injector. The boss 9 and flanged heads 10 and 14 may be suitably bolted together.

Centrally within the mixing chamber are suitably supported an alined series of truncated hollow conical deflectors 17, 20 and 23, three being shown in the drawings. These conical deflectors may have flaring upper rims 18, 21 and 24, and cylindrical short extensions 19, 22 and 25 at their lower ends, but it is obvious that they may merely be simple cones. The upper portion of the cone 17, preferably projects substantially in line with the gas inlets 4 and 5, and the nozzle end of the injector projects a short distance within the cone 17. The lower or apex end 19 of the upper cone similarly projects within the upper portion of the intermediate cone 20, while the apex end of the cone 20 projects within the flaring upper portion of the lower cone 23, the apex ends of the cones having successively greater diameters than the preceding one. The lower end of the cone 23 also projects into a similarly disposed conical throat 26, flanged at 27 and securely bolted to the base flange of the casing 1. This conical throat 26 is also provided with a flanged apex 28 bolted to the flanged apex end of an inverted conical tube 29, terminating in one or more tubular sections 30 and 31, which latter are connected by an elbow 32 with the interior lower portion of a retarder or baffling tank 33, the arrangement forming a conduit, for the intermingled raw juice and gases, between the injector and the retarder.

The retarder may be of sectional construction and suitable contour, rectangular, or circular as shown and extends a substantial distance upwardly alongside the down-pipe or conduit sections 31 and 30, which it supports by its connection at the base with the elbow 32, and its upper end by the connecting rib 34. The retarder or baffle tank, itself, may be suspended within an outer receiving tank, for the clarified liquid, by the cross-channel bars 36, supported by the receiving tank 35, on which channel bars the lugs 37 of the retarder rest.

The interior of the retarder has a series of baffling plates or barriers 38 and 39, alternately projecting inwardly, in opposite directions, and extending substantially beyond the center of the tank, in overlapped relation, forming an interrupted tortuous passageway for retarding the flow of the ascending gaseous impregnated liquid. The lowermost baffle 38 is located just above the inlet elbow 32, and is disposed toward the opposite side of the tank, and the uppermost baffle 39 is oppositely arranged and is located just below the liquid outlet 40, which latter discharges into the outer or receiving tank 35, from whence the clarified liquid may be conducted to storage tanks and utilized at will for filtration, evaporation, crystallization, and centrifugal treatment.

41 designates a pipe leading into the top portion of the retarder, and provided at its outer end with a faucet 42, for sampling purposes.

43 designates a rotary plug drainage cock for the tank 33, connected by a spindle or rod 44, extending through and above the tank 35, with an operating lever or hand wheel 45, and 46 designates a plug closed drainage outlet at the bottom of the tank 33.

The cock 43 may be employed for drawing off the more or less settled, clarified liquor, remaining in the retarding tank 33, after operations have ceased, and the lower plug closed drainage outlet 46 may be employed for drawing off the liquor in the bottom of the tank, and which liquor in the bottom of the tank may contain more or less sediment. Or these drainage cocks may be utilized in the operation of washing out the retarder tank.

As a matter of fact my device might be used independently as a carbonating or as a sulfurizing apparatus, in which case the juice would have to be run twice through the apparatus; but used conjointly for simultaneously carbonating and sulfurizing, the carbonic acid gas (CO_2) is introduced through the inlet 5, from a suitable source, and the sulfurous acid gas (SO_2) is introduced through the inlet 4, from the generator for the sulfur fumes, but as these sources of supply may be of common origin, they have been omitted from the drawings as unnecessary, not being a specific part of the invention itself. Also the raw juice may be led from tanks, or directly from the crushers in the case of cane juice, or from the diffusion vats in the case of beet juice. In practice, I preferably pump the raw juice through the inlet pipe 15, under an approximate pressure of forty pounds, from whence it is delivered to the injector nozzle 11, and through the orifices 13 in jets or sprays, leaving a hollow or open central zone, encompassed by the jets, providing a larger surface area for the initial contact of the treating gas or gases drawn in by the suctional or inductive action of the incoming juice. These jets may be directed to impinge against the inner conical wall of the first conical deflector, causing a splashing or diverting effect for more thoroughly mixing or commingling the particles of juice and treating gases, the gases sucked into the chamber 1 being also more positively drawn into and through the successive cones, in entrained relation with the juice, by the suction created by the juice itself passing therethrough. So also the juice successively passes through the intermediate and lower cones, the upper or base end of the inverted cones being open to allow of the entrance of the gases from the chamber 1 to more thoroughly permeate the juice with the treating gases during the initial stage of operation.

As the partially permeated juice passes into the conical throat 26, gases from the bottom of the chamber 1 are also drawn into the throat through the opening 2, and in passing through the throat 26 there is a more or less tendency toward a contraction or compression of the mixed juice and gas during passage, as it passes through the restricted necks or apex ends of the throat and the inverted conical tube section 29, in which latter there is an after tendency toward gradual expansion as the mixture passes therethrough to the cylindrical tube sections below.

Thus the juice and gases are quite thoroughly combined initially, the entrained gases further acting on the juice as they pass in commingled relation, in the same direction of flow, to the retarder, wherein it is apparent that the mixture is more or less compressed and retarded in its tortuous passage around the baffles, causing in reaction a more intimate impregnation of the juice in its obstructed ascent to the discharge outlet.

Although I have described the invention in detail as illustrated, it will be understood that obvious minor changes might be made in the structural manufacture of the various elements without departing from the spirit of the invention, and without vitiating any of the principles thereof, and—

Having thus made a full disclosure of my improved apparatus and the operation of the same, what I claim is:—

1. In apparatus for treating saccharine juices, including a receiving receptacle having a suitable outlet and provided with an inlet for a treating gas, in combination with a juice injector, projecting within said receptacle and having a nozzle discharge so formed as to direct the injected juice within said receptacle in the form of a wall of juice having an open central zone, substantially as described.

2. In apparatus for treating saccharine juices, including a receiving receptacle having a suitable outlet and provided with an inlet for a treating gas, in combination with a juice injector, projecting within said receptacle and provided with a nozzle end having a plurality of jet orifices, functioning substantially as described.

3. In apparatus for treating saccharine juices, including a receiving receptacle having a suitable outlet and provided with an inlet for a treating gas, in combination with a juice injector, projecting within said receptacle and provided with a nozzle end having a plurality of tapering jet orifices functioning substantially as described.

4. In apparatus for treating saccharine juices, including a receiving receptacle having a suitable outlet and provided with an inlet for a treating gas, in combination with a juice injector, projecting within said receptacle and provided with a nozzle end having a plurality of circularly disposed jet orifices, for directing the injected juice into said receptacle in the form of a wall of jets having a central open zone, substantially as described.

5. In apparatus for treating saccharine juices, including a closed receptacle, forming a gas chamber, provided with an inlet for a treating gas, in combination with means for receiving and conveying the incoming juice and treating gas through and from said receptacle, including as an element a hollow truncated inverted cone, suitably mounted in said receptacle, and a juice injector directly discharging into said hollow cone, substantially as described.

6. In apparatus for treating saccharine

juices, including a closed receptacle, forming a gas chamber, provided with an inlet for a treating gas, in combination with means for receiving and conveying the incoming juice and treating gas through and from said receptacle, including as an element a hollow member, preferably in the form of a truncated inverted cone, suitably mounted in said receptacle adjacent said gas inlet, and a juice injector directly discharging into said hollow member, in inductive relation to said gas inlet, and functioning in the dual capacity of a juice inlet and as an aspirator for drawing said treating gas into said receptacle by the suctional force of the incoming juice itself, substantially as described.

7. In apparatus for treating saccharine juices, including a closed receptacle, forming a gas chamber, provided with an inlet for a treating gas, in combination with means for receiving and conveying the incoming juice and treating gas through and from said receptacle, including as an element a hollow member, preferably in the form of a truncated inverted cone, suitably mounted in said receptacle adjacent said gas inlet, and a juice injector directly discharging into said hollow member, in inductive relation with said gas inlet said functioning substantially as set forth, and said juice injector being provided with a nozzle end having a discharge so formed as to direct the injected juice within said hollow member in the form of a wall of juice having an open central zone, substantially as described.

8. In apparatus for treating saccharine juices, including a closed receptacle, forming a gas chamber, provided with an inlet for a treating gas, in combination with means for receiving and conveying the incoming juice and treating gas through and from said receptacle, including as an element a hollow member, preferably in the form of a truncated inverted cone, suitably mounted in said receptacle adjacent said gas inlet, and a juice injector directly discharging into said hollow member, in inductive relation with said gas inlet and functioning substantially as set forth, and said juice injector being provided with a nozzle end having a plurality of jet orifices, substantially as described.

9. In apparatus for treating saccharine juices, including a closed receptacle, forming a gas chamber, provided with an inlet for a treating gas, in combination with means for receiving and conveying the incoming juice through and from said receptacle, including as element a hollow member, preferably in the form of a truncated inverted cone, suitably mounted in said receptacle adjacent said gas inlet, and a similarly disposed hollow element, communicating with and closing the bottom of said receptacle and receiving the discharge from said internal hollow member, and an outlet conduit leading from said external hollow member, and a juice injector discharging into said internal member and constructed and functioning substantially as described.

10. In apparatus for treating saccharine juices, including a receptacle adapted to initially receive the juice to be treated and a suitable treating gas, and provided with an outlet conduit of substantial length to permit of the action of said gas on said juice during their passage therethrough, in combination with means at the other end of said outlet conduit, operating to cause the juice to flow with a less accelerated motion to positively retard the final delivery of the juice and treating gas and enabling the gas in its reaction on said juice to be more thoroughly absorbed thereby, substantially as described.

11. In apparatus for treating saccharine juices, the combination of a receptacle adapted to initially receive the juice to be treated in conjunction with a suitable treating gas, said receptacle being provided with an outlet conduit of substantial length to permit of the action of said gas on said juice during their passage therethrough, in combination with a retarding chamber at the other end of said outlet, and being provided with internal means for diverting the passage of the juice and gases therethrough and positively retard their passage with a less accelerated movement, enabling the gases to react on the juice to cause a more thorough final impregnation and absorption in said retarding chamber, substantially as described.

12. In apparatus for treating saccharine juices; the combination of a gas chamber; a series of closed hollow truncated inverted cones, suitably mounted in said chamber, the open end of the cone projecting in proximity to the hollow base portion of the next succeeding cone; an inlet for delivering raw juice within the first cone of the series; means for introducing a treating gas or gases to said gas chamber, into initial contact with the incoming raw juice; and a conduit, leading from said gas chamber and disposed to receive the discharge from the last cone of the series, for carrying off the combined juice and gases from said cones and chamber, in countercurrent relation and in the same direction of flow, substantially as described.

13. In apparatus for treating saccharine juices; the combination of a gas chamber; a series of closed hollow truncated inverted cones, suitably mounted in said chamber, the open end of one cone projecting in proximity to the hollow base portion of the next succeeding cone; an injector for delivering the

2 App-273

Defendant's Exhibit 44-4

1,195,044 3

saccharine juice within the first cone of the series; means for introducing treating gas into said gas chamber; and a conduit leading from said gas chamber and disposed to receive the discharge from the last cone of the series, said conduit consisting of a plurality of tubular elements, including a conical throat, similarly disposed as said internal cones, communicating with and closing the bottom of said gas chamber, and an oppositely disposed conical tube, having its apex end adjoining and communicating with the open apex end of said conical throat, substantially as described.

14. In apparatus for treating saccharine juices; the combination of a retarding chamber having a delivery outlet; and means coöperating therewith to initially treat the incoming juice with a treating gas, and conducting same to said retarding chamber, in commingled relation and in the same direction of flow, said retarding chamber being provided with alternately opposed overlapping baffles, for diverting the passage of the treated juice therethrough in a tortuous path and with a less accelerated movement, enabling the gases to react on the juice and cause a more thorough final impregnation and absorption of the treating gas by said juice, substantially as described.

15. In apparatus for treating saccharine juices; the combination of a gas chamber; an injector for delivering the juice to said chamber at a substantial pressure; means for introducing a treating gas to said chamber into contact with said incoming juice; means in said chamber for aiding the initial mixture of said juice and treating gas; a conduit leading from said gas chamber and extending a substantial distance below same for conducting said juice and entrained gas from said chamber, in the same direction of flow, and enabling said gas to act on said juice; a retarding chamber at the lower end of said conduit and communicating at its bottom therewith, said retarding chamber extending vertically of said conduit, and being provided with a discharge outlet at its upper end; and baffling means within said retarding chamber for obstructing and diverting the passage of the ascending treated juice, causing the same to flow upwardly at a diminished speed to permit a prolonged reaction of the gases on the juice and cause a more thorough final impregnation and absorption of the treating gases by said juice, substantially as described.

16. In apparatus for treating saccharine juices; the combination of a gas chamber; a series of alined hollow truncated inverted cones, suitably mounted in said chamber, the apex of one cone projecting in proximity to the hollow base portion of the next succeeding cone; an injector for delivering the saccharine juice under a substantial pressure, within the first cone of the series; means for introducing treating gas into said chamber into initial contact with the incoming juice; a conduit communicating with the bottom of said gas chamber and disposed to receive the discharge from the last cone of the series, said conduit extending a substantial distance below said chamber; a retarding chamber communicating at its bottom with the lower end of said conduit, said retarding chamber extending vertically alongside of said conduit and being provided with a discharge outlet at its upper end; and a series of alternately opposed overlapping baffles located in said retarding chamber, for obstructing and diverting the course of the ascending juice into a tortuous path, causing the same to flow upwardly at a diminished speed, substantially as described.

In testimony whereof I affix my signature.

NELSON A. LOCKWOOD.

N° 6012 **A.D. 1909**

(Under International Convention.)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in Germany), } **13th July, 1908**

Date of Application (in the United Kingdom), 12th Mar., 1909

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 18th Nov., 1909

COMPLETE SPECIFICATION.

Improvements in or relating to Mixing Devices.

We, FELTEN AND GUILLEAUME-LAHMEYERWERKE ACTIENGESELLSCHAFT, of 45, Höchsterstrasse, Frankfort on Main, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a new mixing device chiefly intended for producing such mixtures from a gas or vapour-like substance and a liquid substance, in which either the one or the other substance or the mixture are unstable. A special important field of application for the new mixing device are ozone apparatus in which ozone-containing air is to be mixed as quickly and thoroughly as possible with a liquid to be ozonised for instance for the purpose of sterilising, since it is well known that ozone decomposes very quickly and loses its efficiency.

The present invention comprises a jet apparatus for mixing gases with fluids provided in the mixing chamber through which the fluid passes, with several

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 18th Nov., 1909

COMPLETE SPECIFICATION.

Improvements in or relating to Mixing Devices.

We, FRITZ AND GUILLEAUME-LAHMEYERWERKE ACTIENGESELLSCHAFT, of 45, Höchsterstrasse, Frankfort on Main, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a new mixing device chiefly intended for producing such mixtures from a gas or vapour-like substance and a liquid substance, in which either the one or the other substance or the mixture are unstable. A special important field of application for the new mixing device are ozone apparatus in which ozone-containing air is to be mixed as quickly and thoroughly as possible with a liquid to be ozonised for instance for the purpose of sterilising, since it is well known that ozone decomposes very quickly and loses its efficiency.

The present invention comprises a jet apparatus for mixing gases with fluids provided, in the mixing chamber through which the fluid passes, with several plates bent, preferably, in the form of baskets and provided with apertures in such a manner that the apertures of one plate always lie over the full portions of the next plate, so that the jet of fluid between each two plates is divided into several divisional currents striking against each other.

A construction of the mixing device according to this invention is illustrated in the accompanying drawing.

Figure 1 is a longitudinal section through the apparatus.

Figures 2, 3 and 4 show the plates arranged in the path of the liquid jet in bottom view, side elevation and plan.

The body *a* of the mixing apparatus which of course could also consist of several parts, serves as an injector. It is connected by means of the screw-thread *b* to the liquid pipe, and the liquid passes through the perforation *c*, and the gaseous substance, for instance, ozone-air, through a perforation *d* into the conically widening chamber *e*, the widening of which produces in a well known manner the suction of the gas from the perforation *d* owing to the flow of the liquid from the perforation *c* into the widened chamber *e*.

In the path of the liquid jet are arranged according to this invention several plates *f* bent in the shape of a basket, the bottoms of which are provided with apertures *h*. When the plates are inserted into the body *a*, the apertures *h* are

Note

Page 274 is blank

in such position that the apertures of one plate lie over the full portions of the other plates. They are secured in that position by the plates *f* being provided with projections *i* by means of which each plate engages with the apertures *h* of the adjoining plate.

The plates *f* are secured in the interior of the body *a* by means of a screw cap *g*.

The parts *f* could also be made of short tubes provided with finger-like projections bent in such a manner as to form a basket shaped bottom.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A jet apparatus for mixing gases with fluids provided, in the mixing chamber through which the fluid passes, with several plates bent, preferably, in the form of baskets and provided with apertures in such a manner that the apertures of one plate always lie over the full portions of the next plate, so that the jet of fluid between each two plates is divided into several divisional currents striking against each other.

2. A jet apparatus according to Claim 1 in which the plates are provided at their edges with projections which engage with the apertures of the following plates for the purpose of securing the plates in position.

3. The complete mixing device substantially as described or as illustrated in the accompanying drawings.

Dated this 11th day of March, 1909.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.,
Chartered Patent Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1909.

A.D 1909. March 12. № 6012.

FELTEN & *others'* Complete Specification

1 SHEET

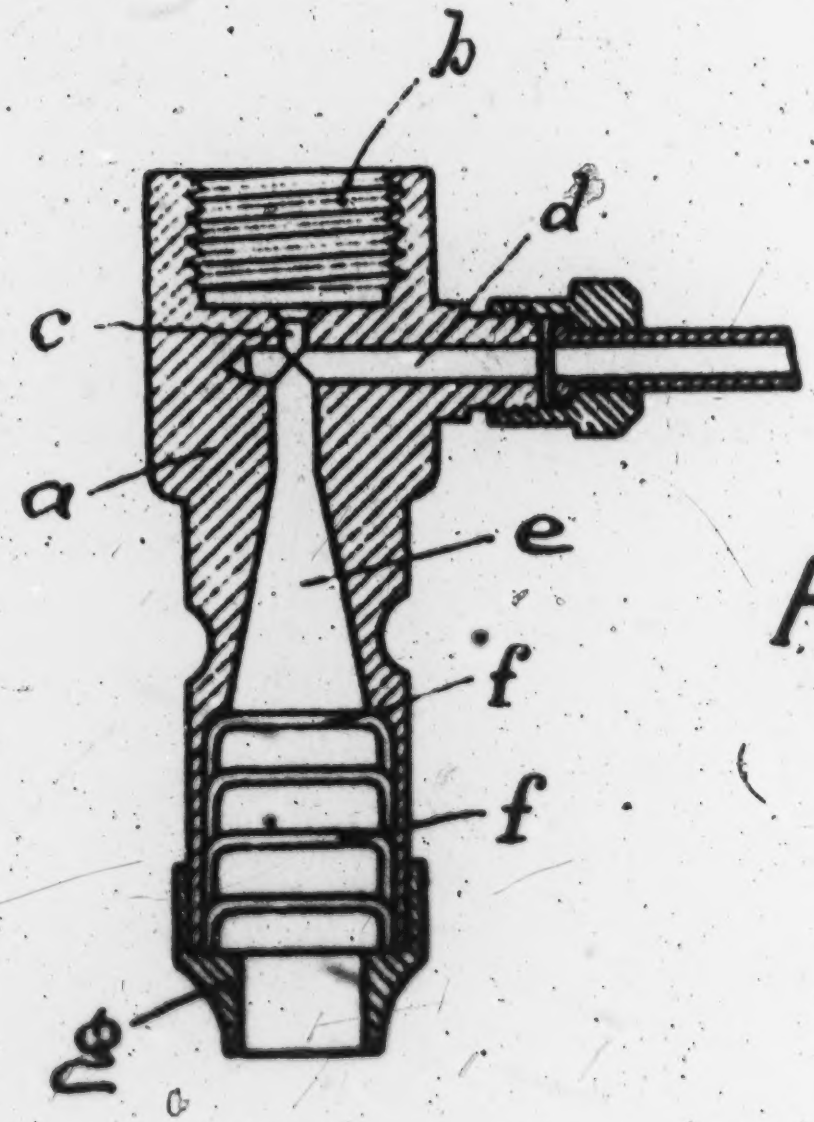


Fig. 1.

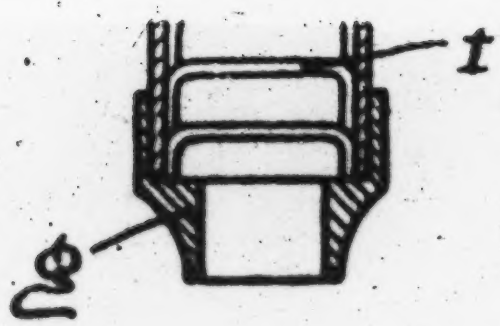


Fig. 2.

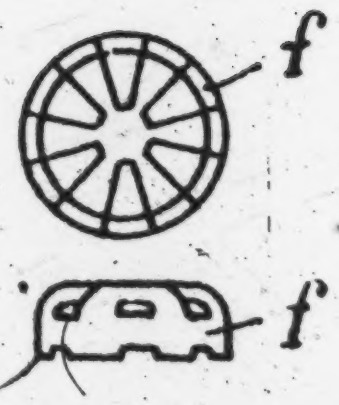


Fig. 3.

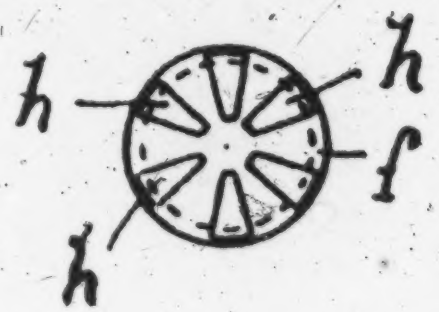


Fig. 4.

Harrison & Sons, Printers to the

(Page 278 in Plank)

136,663

PATENT SPECIFICATION

Application Date, Dec. 30, 1918. No. 21,760/18.
Complete Left, June 30, 1919.
Complete Accepted, Dec. 24, 1919.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Splash Preventers for Domestic and other Taps.

I, ALFRED JOHN PRASER, Director, of Trafalgar Works, Palmer Street, Bordesley, Birmingham, do hereby declare the nature of this invention to be as follows:

This invention comprises certain improvements in or relating to splash preventers for domestic and other taps.

According to the present invention, I provide a rubber tubulus adapted to be fixed over the delivery part of the tap, and I combine with the lower extremity of said tubulus a metallic nozzle. A strainer may be incorporated.

In a convenient embodiment of the present invention, the tubulus is furnished around the top with an external integral rim or flange which strengthens it. At or near its lower extremity the tubulus is formed with an internal annular recess or shoulder. This is adapted to receive the upper rim of a sheet metal nozzle which converges downwardly. Said nozzle may be of taper form throughout its part which depends from the tubulus; above this taper part it may have an integral short cylindrical part and at the top of said cylindrical part the metal is spun or otherwise formed to an outwardly projecting rim or head. This rim or head is adapted to form an internal channel which embraces the outer edge of wire gauze adapted to function as a strainer. The said rim or head is externally adapted to be received by the annular recess in the tubulus. At its lower extremity the tubulus may have an internal flange or may be otherwise moulded to conform with the external surface of the upper part of the taper portion of the metallic nozzle. The metallic nozzle part may be assembled from the upper extremity of the tubulus through the interior of the latter.

In a modified embodiment of the present invention, the rubber tubulus is provided at its lower as well as at its upper extremity with an external flange or enlargement, and the metallic nozzle is formed at its upper part with an internal annular channel adapted to receive the lower enlargement of the tubulus. Between the lower extremity of the tubulus and the lower side of the

Application Date, Dec. 30, 1918. No. 21,780/18.
Complete Left, June 30, 1919.
Complete Accepted, Dec. 24, 1919.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Splash Preventers for Domestic and other Taps.

I, Alfred John Fraser, Director, of Trafalgar Works, Palmer Street, Bordesley, Birmingham, do hereby declare the nature of this invention to be as follows:

This invention comprises certain improvements in or relating to splash preventers for domestic and other taps.

According to the present invention, I provide a rubber tubulus adapted to be fixed over the delivery part of the tap, and I combine with the lower extremity of said tubulus a metallic nozzle. A strainer may be incorporated.

In a convenient embodiment of the present invention, the tubulus is furnished around the top with an external integral rim or flange which strengthens it. At or near its lower extremity the tubulus is formed with an internal annular recess or shoulder. This is adapted to receive the upper rim of a sheet metal nozzle which converges downwardly. Said nozzle may be of taper form throughout its part which depends from the tubulus; above this taper part it may have an integral short cylindrical part and at the top of said cylindrical part the metal is spun or otherwise formed to an outwardly projecting rim or head. This rim or head is adapted to form an internal channel which embraces the outer edge of wire gauze adapted to function as a strainer. The said rim or head is externally adapted to be received by the annular recess in the tubulus. At its lower extremity the tubulus may have an internal flange or may be otherwise moulded to conform with the external surface of the upper part of the taper portion of the metallic nozzle. The metallic nozzle part may be assembled from the upper extremity of the tubulus through the interior of the latter.

In a modified embodiment of the present invention, the rubber tubulus is provided at its lower as well as at its upper extremity with an external flange or enlargement, and the metallic nozzle is formed at its upper part with an internal annular channel adapted to receive the lower enlargement of the tubulus. Between the lower extremity of the tubulus and the lower side of the annular channel within the upper part of the nozzle a disc or discs of wire gauze may be incorporated to function as a strainer. The depending part of the metallic nozzle may be of taper form as in the previous embodiment.

By virtue of the elasticity of the rubber the metallic and rubber parts of the splash preventer may be readily separated and reassembled. The splash

preventer according to the present invention also forms an effective crockery guard.

Dated this 24th day of December, 1918.

LEWIS WM. GOULD, A.I.Mech.E.,
Fellow of the Chartered Institute of Patent Agents,
Agent for the Applicant,
5, Corporation Street, Birmingham.

COMPLETE SPECIFICATION.

Improvements in or relating to Splash Preventers for Domestic and other Taps.

I, ALFRED JOHN PURSER, Director, of Trafalgar Works, Palmer Street, Bordesley, Birmingham, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to splash preventers for domestic and other taps, which are constructed of two parts or elements connected together, one part or element being formed of rubber or the like adapted to be fixed over the delivery part of the tap, and the other part or element constituting a metal nozzle; a suitable strainer being incorporated with such two-part device.

Previously an arrangement has been proposed in which a metal nozzle is detachably assembled at the extremity of a tubular rubber attachment portion, in which arrangement however, such metal nozzle has involved a plurality of parts screwed together, one of which parts being permanently secured within the rubber portion, and the other part being screwed upon the first part, while in another proposed arrangement the employment of a one-piece metal nozzle has necessitated the provision of an additional metal member adapted to be inserted within the rubber tubulus for securing the nozzle and tubulus together.

According to the present invention a splash preventer, which also serves as a crockery guard, is provided, comprising a one-piece metallic nozzle portion adapted to be assembled in a readily detachable manner at or near the lower extremity of the rubber tubulus by the detachable insertion of a rim or flange part within a channel or recess, the rubber tubulus extending beyond the upper edge of the metallic nozzle for attachment upon the tap.

In order that this invention may be clearly understood, and readily carried into practice, reference may be had to the appended explanatory sheet of drawings, upon which:—

Figure 1 is a vertical section of one form of splash preventer according to this invention.

Figure 2 is a vertical section of a modified form of a splash preventer.

In a convenient embodiment of the present invention, as shown in Figure 1, the tubulus a is furnished around the top with an external integral rim or flange a^1 which strengthens it. At or near its lower extremity the tubulus is formed with an internal annular recess or shoulder a^2. This is adapted to receive the upper rim b^1 of a sheet metal nozzle b which converges downwardly. Said nozzle b may be of taper form throughout its part which depends from the tubulus a; above this taper part it may have an integral short cylindrical part b^2 and at the top of said cylindrical part b^2 the metal is spun or otherwise formed to an outwardly projecting rim or head b^1. This rim or head b^1 is adapted to form an internal channel which embraces the outer edge of one or more wire gauze portions c adapted to function as a strainer. The said rim or

Defendant's Exhibit 44-3

2 App. 259

No. 881,548. PATENTED MAR. 10, 1908.

C. A. CLAFLIN.

AIR EXHAUSTING LIQUID SUPPLY APPARATUS.

APPLICATION FILED OCT. 9, 1907.

2 SHEETS—SHEET 2.

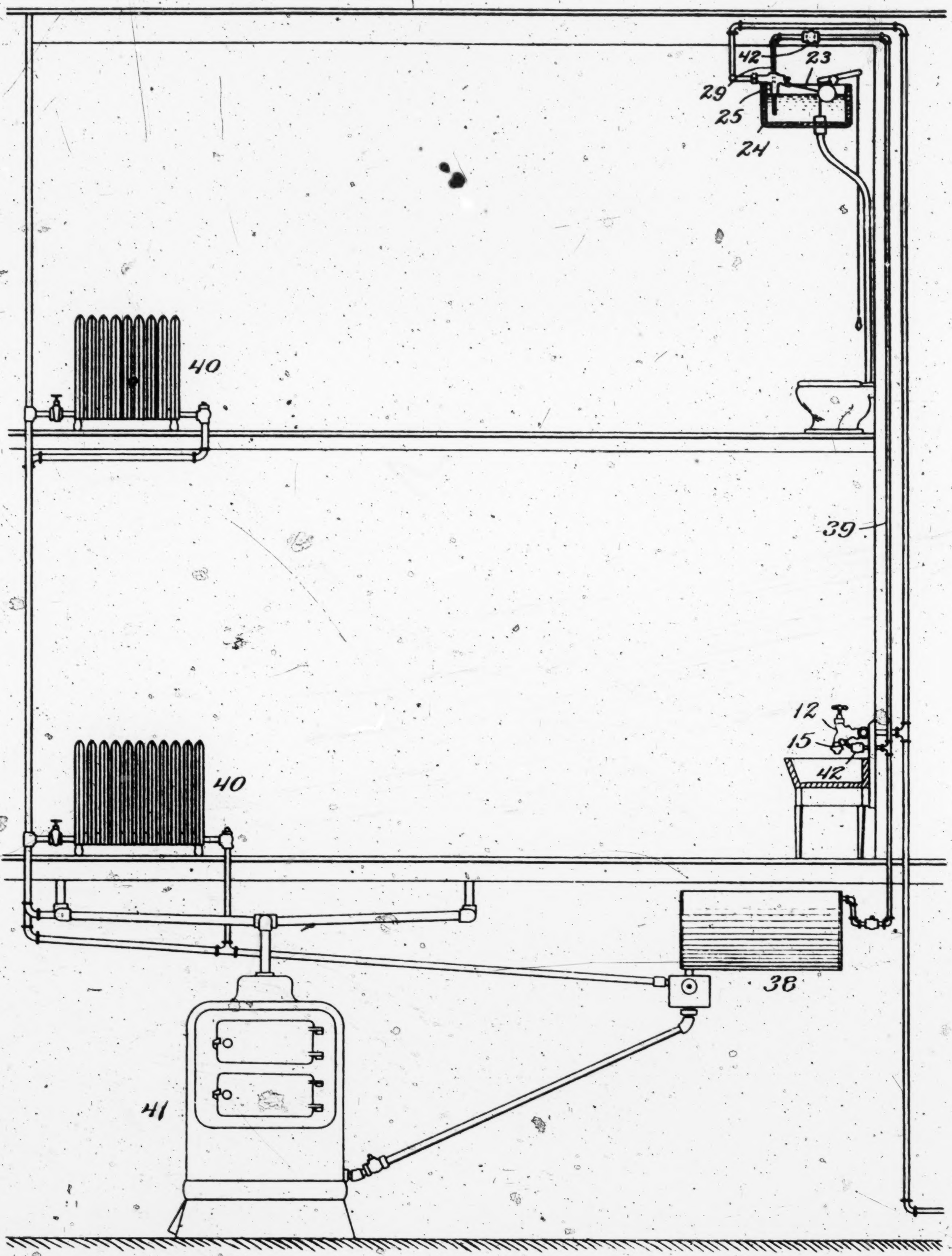


Fig. 6

Witnesses:
Peter H. Peggott
E. Belchelder

Inventor
Charles A. Claflin
by Wright Brown Quinby & May
Attorneys.

Defendant's Exhibit 44-4

2 App. 265

N. A. LOCKWOOD.

APPARATUS FOR THE GASEOUS TREATMENT OF SACCHARINE JUICES.

APPLICATION FILED FEB. 9, 1916.

1,195,044.

Patented Aug. 15, 1916.

2 SHEETS—SHEET 1.

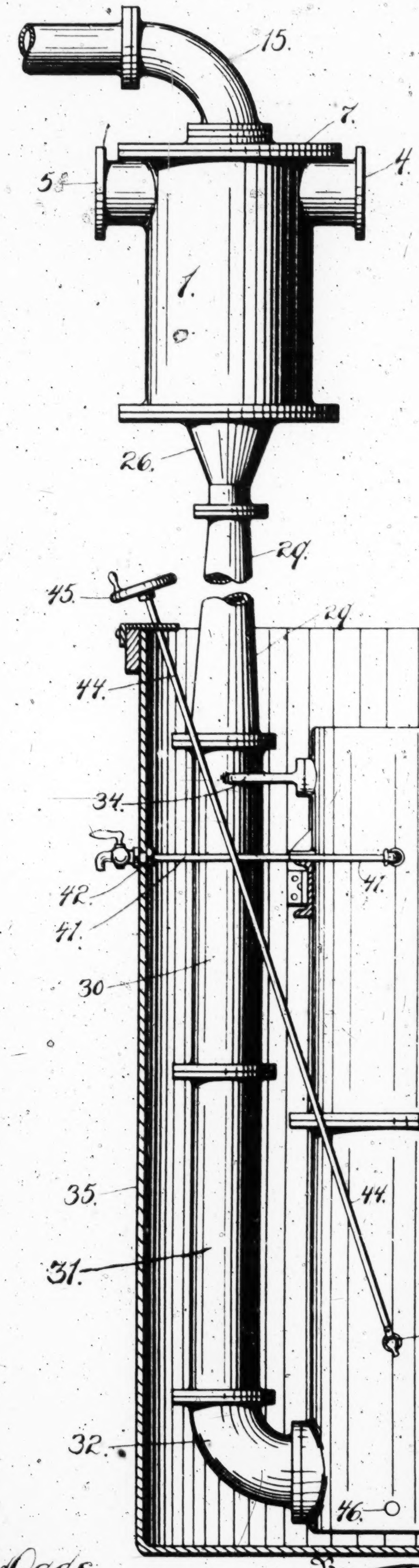


Fig. 1.

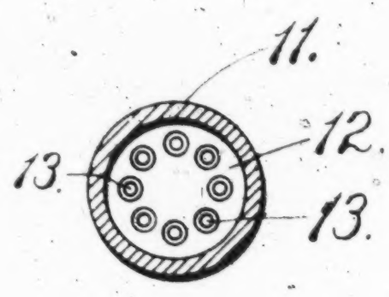


Fig. 4.

Witness
John B. Wade.

Inventor
N. A. Lockwood.
By Wilkinson, Gunstat & Mackaye
his Attorneys.

Defendant's Exhibit 44-4

2 App. 267

N. A. LOCKWOOD.

APPARATUS FOR THE GASEOUS TREATMENT OF SACCHARINE JUICES.

APPLICATION FILED FEB. 9, 1916.

1,195,044.

Patented Aug. 15, 1916.

2 SHEETS—SHEET 2

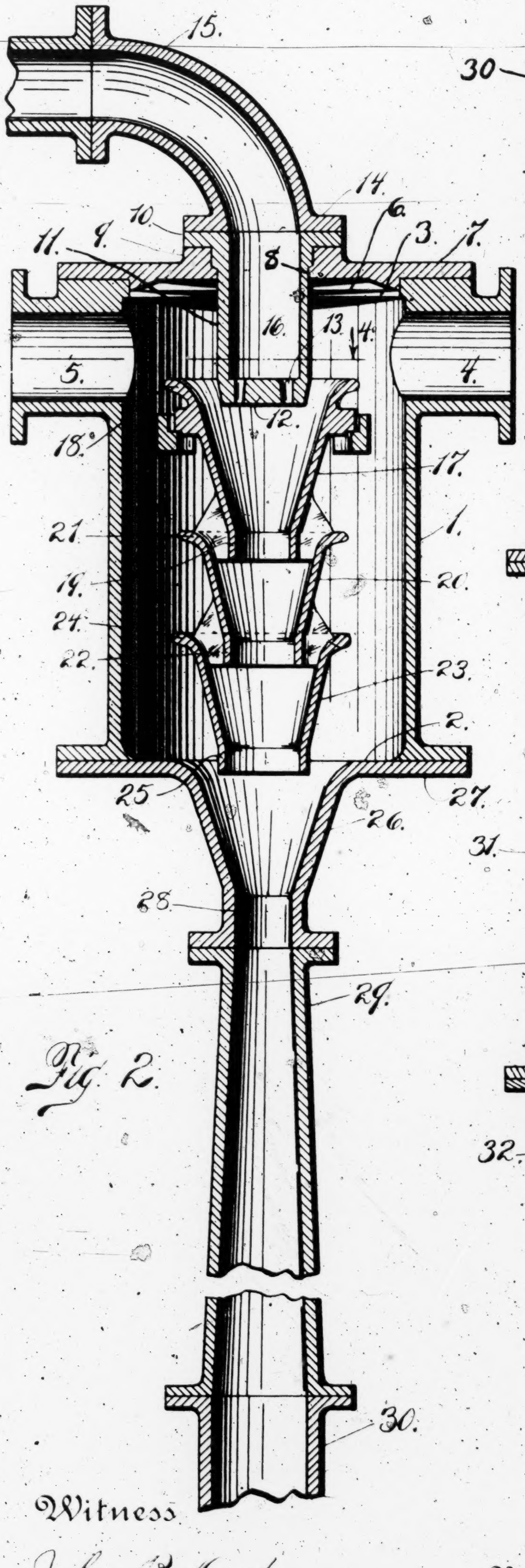


Fig. 2.

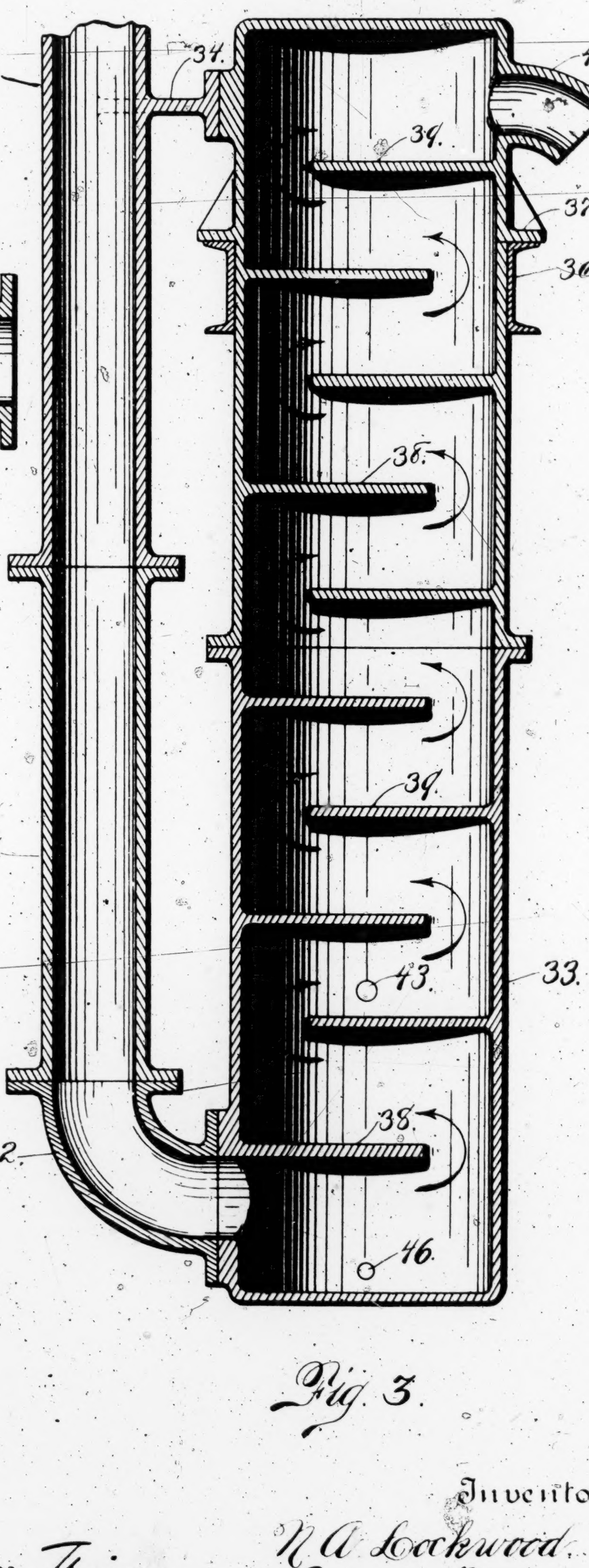


Fig. 3.

Witness
John B. Wade.

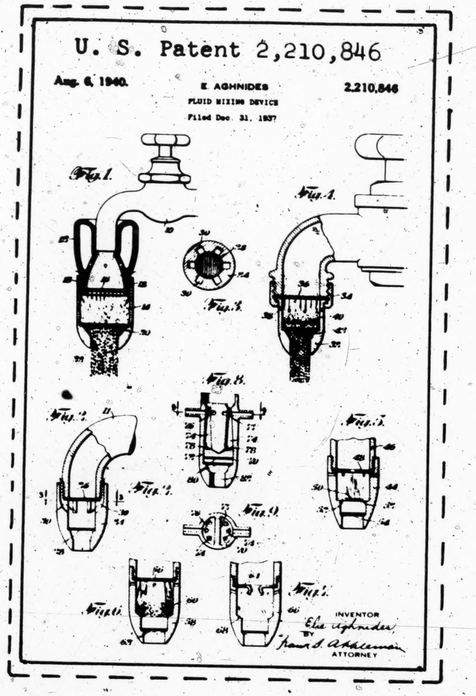
Inventor
N. A. Lockwood.
By Wilkinson, Giusta & Mackaye
his Attorneys.

Chart No. 1

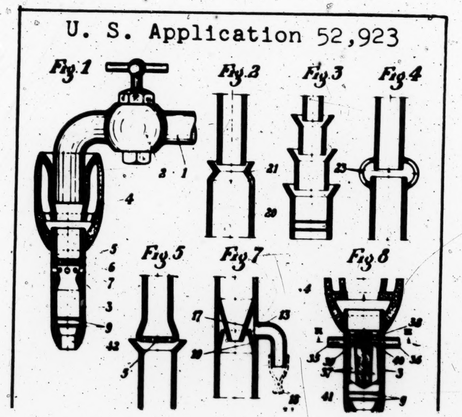
In the United States
Aghnides has sworn that these patents
within the red enclosure are the same invention.

(RED)

U. S. Patent 2,210,846



U. S. Application 52,923



with..

Cana

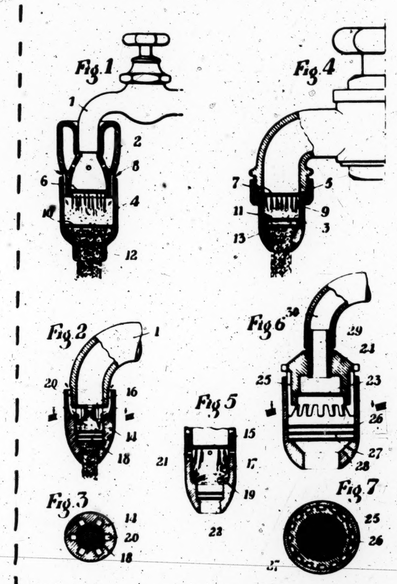
la.

la.

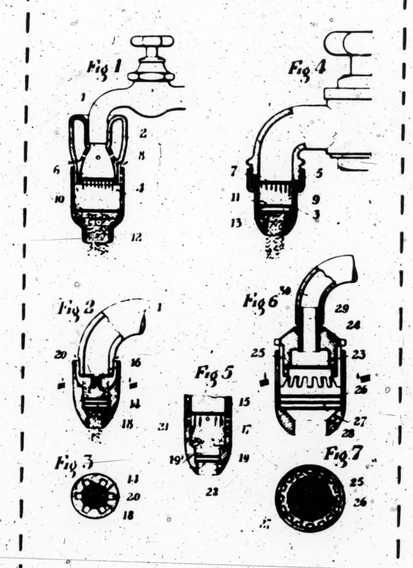
In Canada
Aghnides has sworn that

(GREEN)

Canada Patent 490,112



British Patent 625,084



U. S.
2,210,846 *

is a different invention from both

Belgium
406,702

and

British
468,687

"CHART No. 1"

Defendant's Exhibit 44-11 2 App. 301

M. FUSS.

SYSTEM FOR TREATING LIQUIDS WITH OZONE.

APPLICATION FILED APR. 9, 1909.

1,090,044. Patented Mar. 10, 1914.

2 SHEETS—SHEET 2.

Fig. 7.

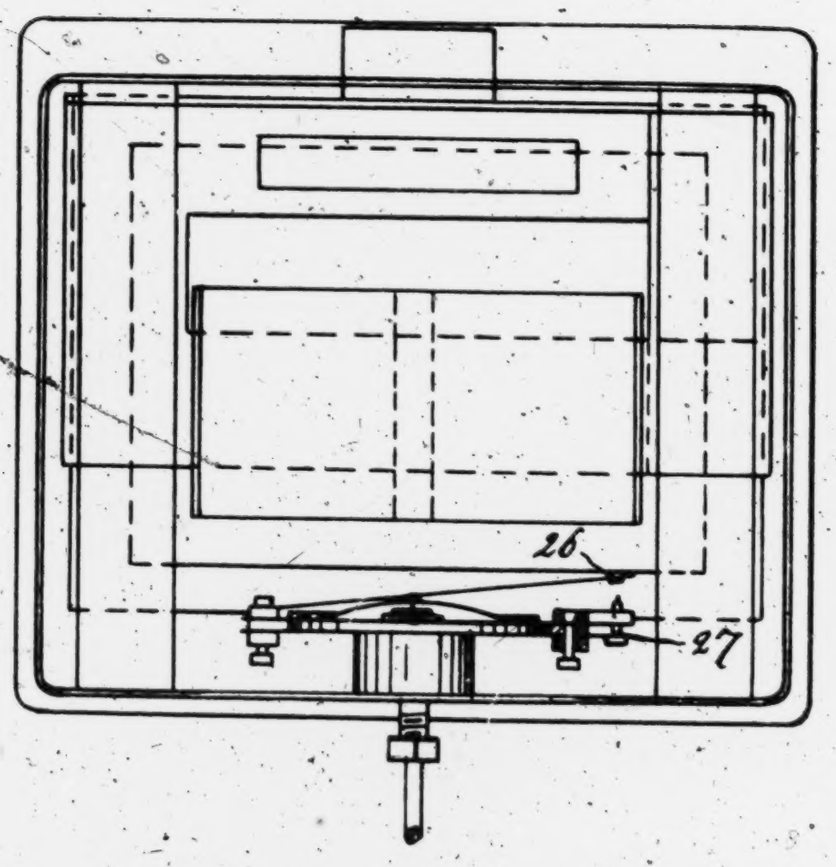


Fig. 6.

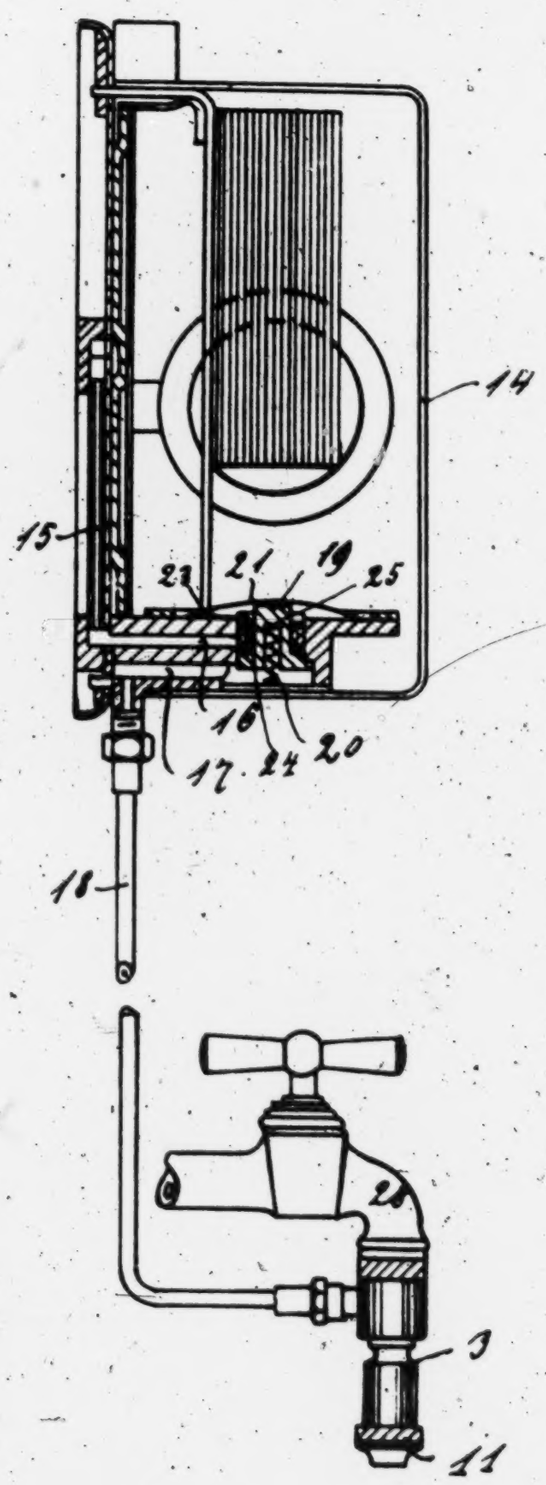


Fig. 2.

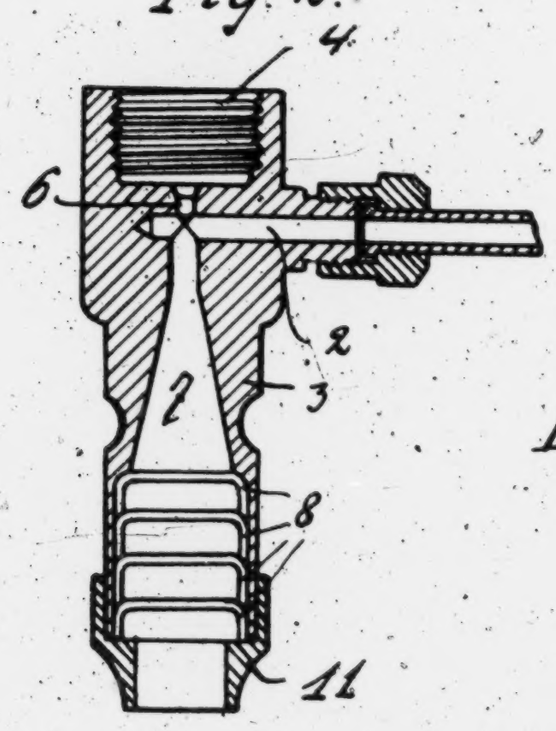


Fig. 3.

Fig. 4

Fig. 5

Witnesses:
J. J. McCarthy
M. G. Crandell

Inventor:
Max Fuss
by Foster Freeman Watson & Coit
Attorneys

A.D. 1898. JUNE 1. N°. 12,315.

VIELLARD'S COMPLETE SPECIFICATION.

1 SHEET

FIG. 1.

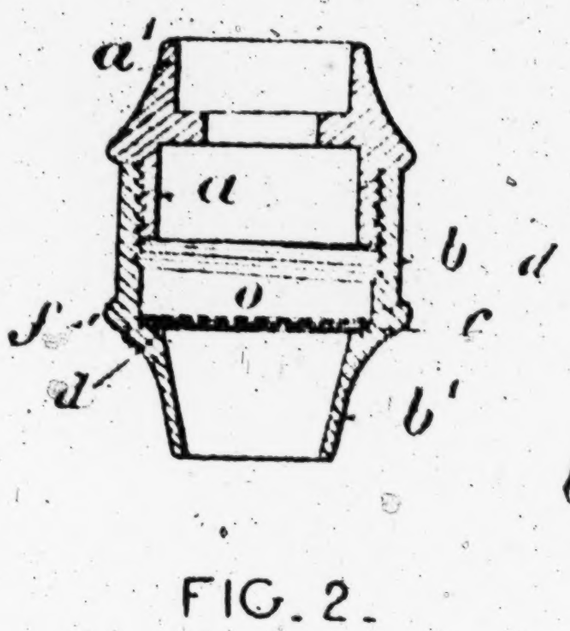


FIG. 3.

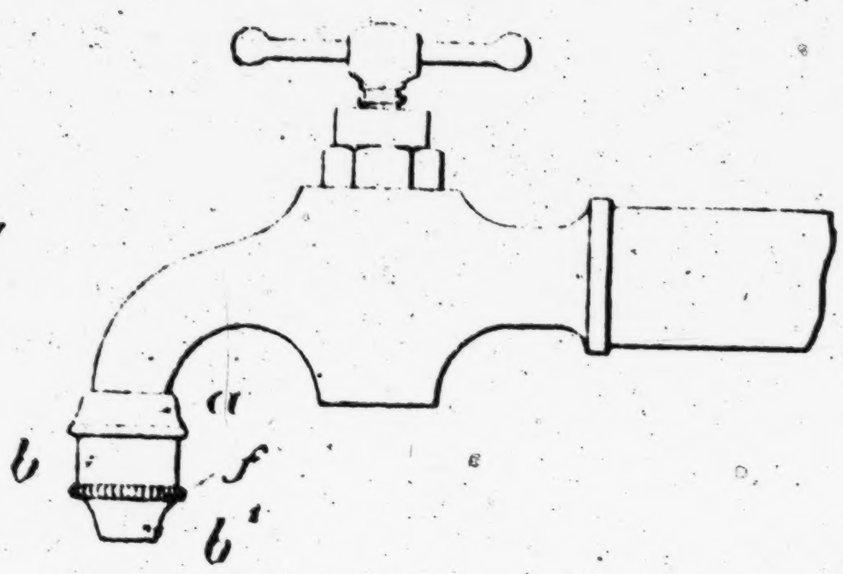


FIG. 2.

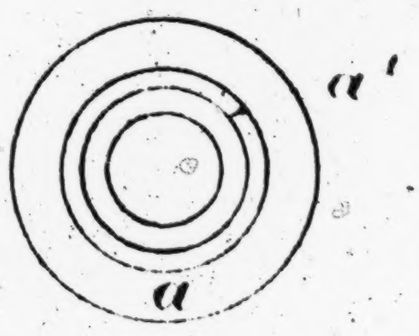


FIG. 4.

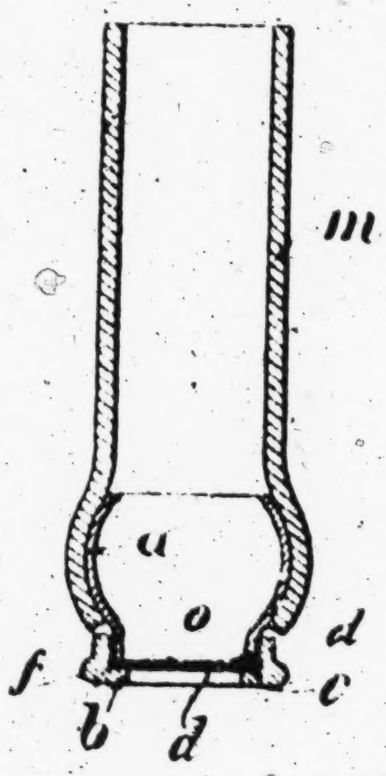


FIG. 5.

FIG. 6.

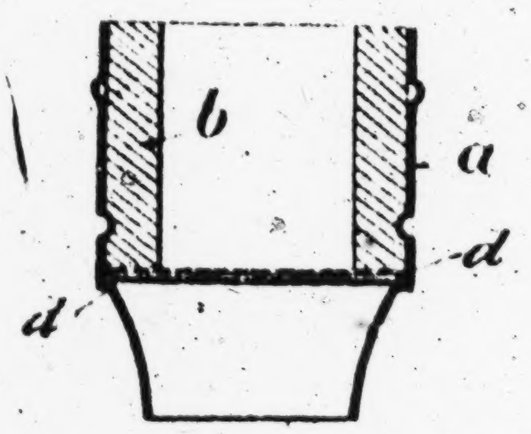


FIG. 8

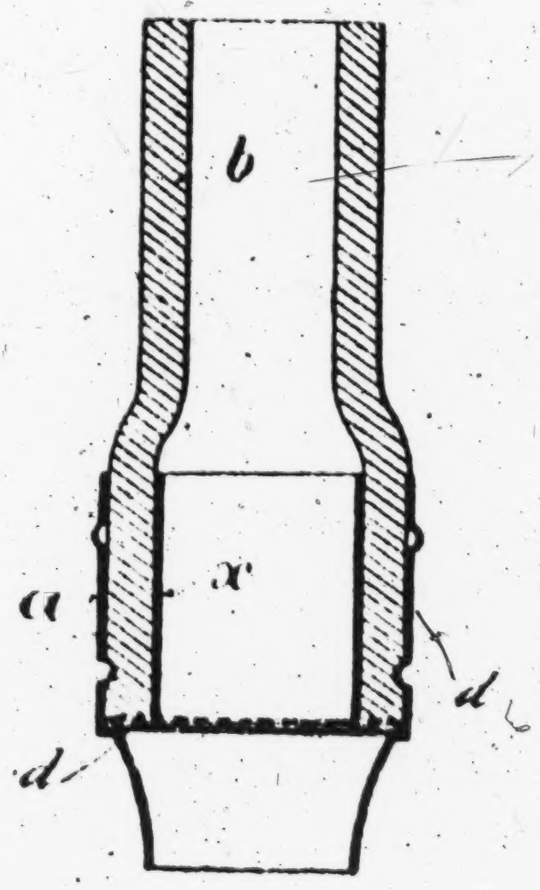
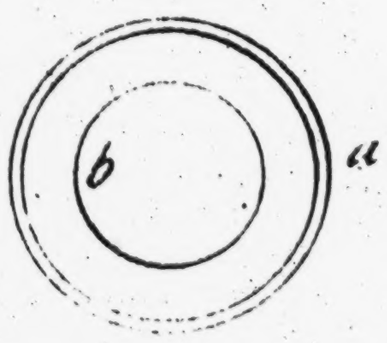


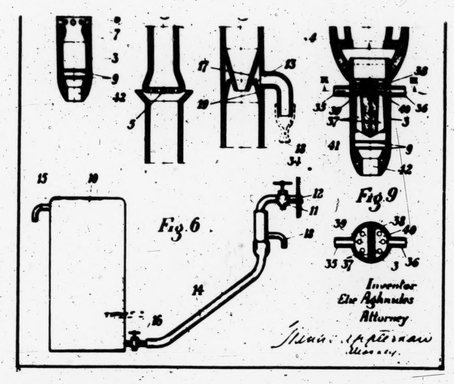
FIG. 7.



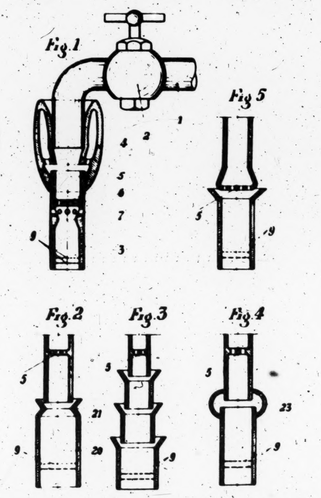
This Drawing is a reproduction of the Original on a reduced scale.

Malby & Sons, Photo-Litho.

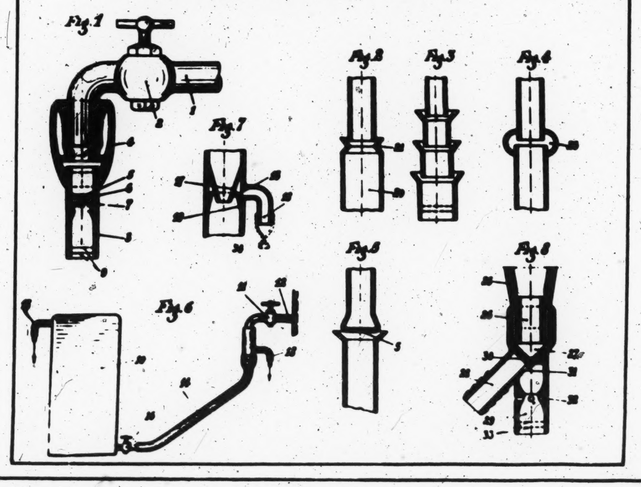
DEPARTMENT OF COMMERCE



British Patent 468,687



Belgium Patent 406,702



1b.

2.

3.

1b.

Belgium 406,702 and British 468,687

In the United States Aghnides has sworn that

U. S. 2,210,846 *

is the same invention as both

Belgium 406,702 and British 468,687

2.

In Canada Aghnides has sworn that

Canada 490,112 *

is a different invention from both

Belgium 406,702 and British 468,687

3.

In Canada Aghnides has sworn that

British 625,084

is a different invention from

British 468,687

:

* (Th an 49

* (The five claims of U. S. Patent 2,210,846 and the five claims of Canadian Patent 490,112 are identical.)

head b^1 is externally adapted to be received by the annular recess a^2 in the tubulus a. At its lower extremity the tubulus a may have an internal flange or may be otherwise moulded to conform with the external surface of the upper part of the taper portion of the metallic nozzle b. The metallic nozzle part may be assembled from the upper extremity of the tubulus through the interior of the latter.

In a modified embodiment of the present invention (Figure 2), the rubber tubulus a is provided at its lower extremity with an external flange or enlargement a^3 similar to the upper flange a^1, and the metallic nozzle b is formed at its upper part with an internal annular channel b^4 adapted to receive the lower enlargement a^3 of the tubulus a. Between the lower extremity of the tubulus a and the lower side of the annular channel b^3 within the upper part of the nozzle b, a disc c or discs of wire gauze may be incorporated to function as a strainer. The depending part of the metallic nozzle b may be of taper form as in the previous embodiment.

By virtue of the elasticity of the rubber the metallic and rubber parts of the splash preventer may be readily separated and reassembled. The splash preventer according to the present invention also forms an effective crockery guard.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A splash preventer for domestic and other taps, which also serves as a crockery guard, comprising a one-piece metallic nozzle portion adapted to be assembled in a readily detachable manner at or near the lower extremity of the rubber tubulus by the detachable insertion of a rim or flange part within a channel or recess, the rubber tubulus extending beyond the upper edge of the metallic nozzle for attachment upon the tap.

2. A splash preventer as claimed in Claim 1 and in which the rubber tubulus is formed with an external rim or flange at both its upper and lower extremities, the metallic nozzle being formed at its upper part with an internal annular channel for receiving the lower rim of the tubulus.

3. A splash preventer as claimed in Claim 1 and in which a rim or flange at the upper part of the nozzle portion is adapted to form an internal channel for embracing or receiving the outer edge of one or more wire gauze portions or like straining elements.

4. A splash preventer as claimed in Claim 2 and in which one or more portions of gauze or straining elements are incorporated between the rim or flange at the lower extremity of the rubber tubulus and the lower side of the annular channel in the upper part of the nozzle.

5. A splash preventer for domestic and other taps substantially as herein set forth or illustrated.

Dated this 24th day of June, 1919.

LEWIS WM. GOOLD, A.I.Mech.E.,
Fellow of the Chartered Institute of Patent Agents,
Agent for the Applicant,
5, Corporation Street, Birmingham.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1920.

136,663 PURSER'S COMPLETE SPECIFICATION. (1 SHEET)

[This Drawing is a full-size reproduction of the Original.]

Fig. 1.

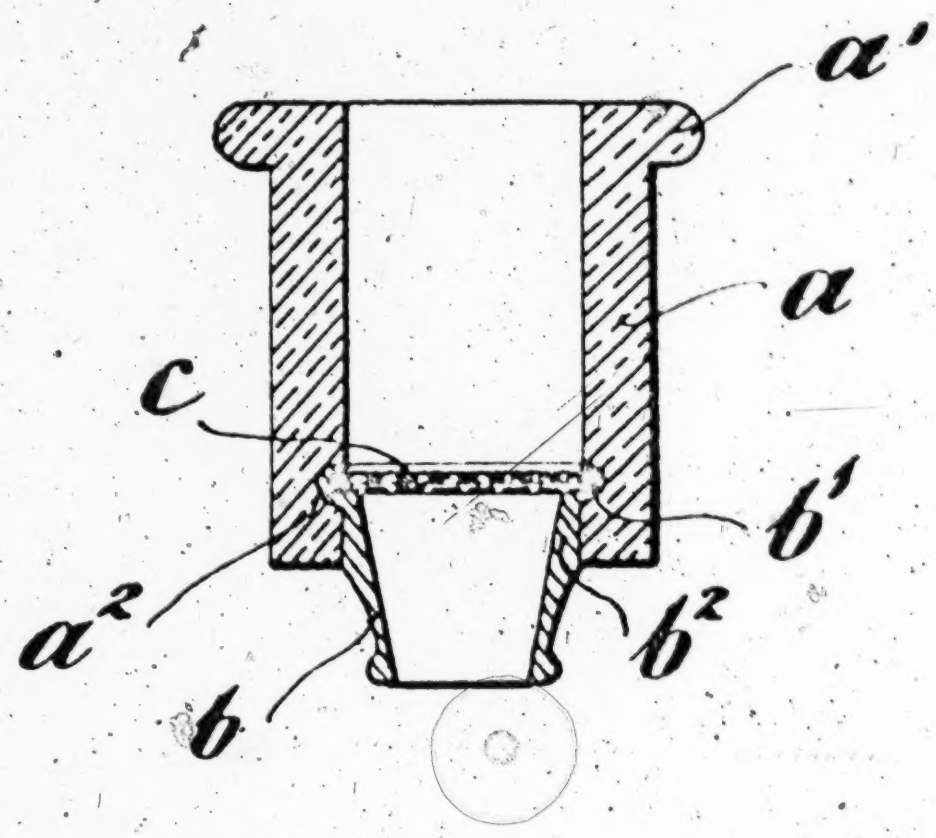
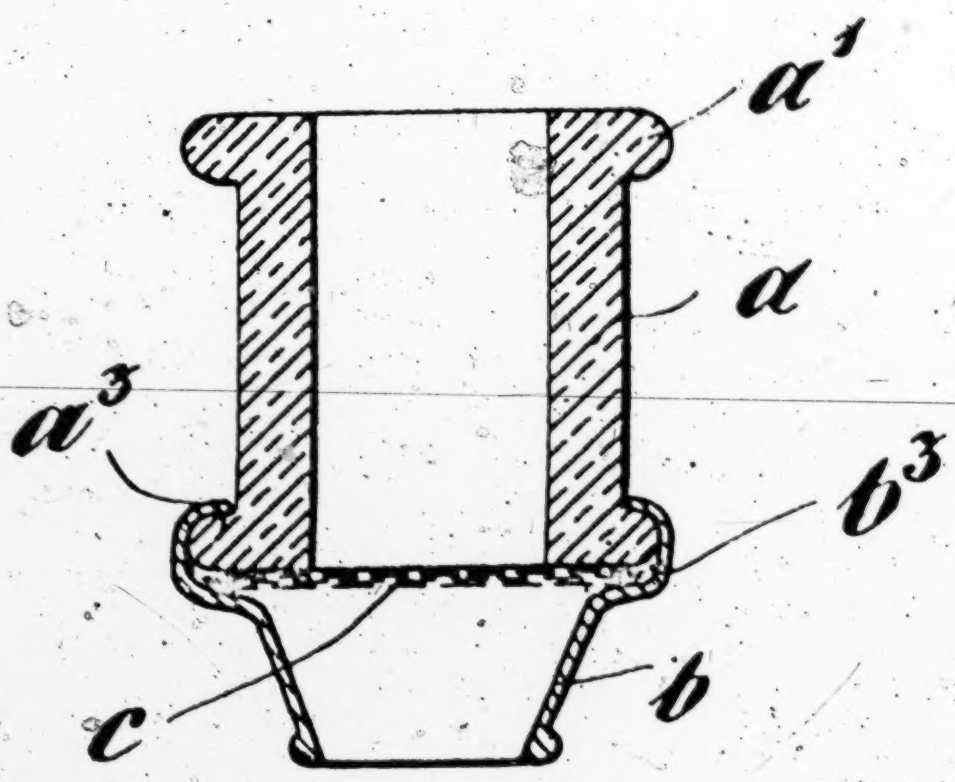


Fig. 2.



Defendant's Exhibit 4483

2 App. 283

PATENT SPECIFICATION

323,242

Application Date: June 28, 1928. No. 18,836/28.

Complete Left: March 28, 1929.

Complete Accepted: Dec. 30, 1929.

PROVISIONAL SPECIFICATION.

Improvements relating to Apparatus for Aerating and Blending Liquids.

I, JOHN WILLIAM BATTERSBY, a British Subject, of 119, Bishopsgate, London, E.C. 2, do hereby declare the nature of this invention to be as follows:—

This invention relates to apparatus for aerating and blending liquids, and in particular for aerating water and blending with it some kind of flavouring to make a hot or cold drink. Although primarily the invention is intended to aerate water and to blend with it fruit juices, syrups, essences, cordials, and the like, the invention is equally effective in aerating and blending spirits such as whiskey or brandy with water. The object is to enable such spirits to be aerated and blended with plain water instead of with soda water as has been usual previously, the result being that the drink is rendered more palatable and the flavour is improved.

According to the present invention the liquid, which may be called the flavouring liquid, is admitted at a controlled rate to a conduit preferably in the form of a pipe, and the liquid with which it is to be blended, which may be called the primary liquid, is forced through a nozzle so that it is formed into a sharp jet stream and draws in air through apertures in a suitable position, and in that condition impinges upon the inflowing flavouring liquid, penetrates it and breaks it up. In the preferred apparatus, the primary liquid is forced through a jet consisting of a perforation at the apex of a cone-shaped nipple and arranged centrally in a pipe, the walls of which are perforated to admit air at some distance in front of the aperture; the flavouring liquid is thus blended and aerated and received in a receptacle, usually a drinking glass, through an outlet to the pipe which may be shaped to prevent undue splashing.

It will be convenient to describe one particular form of apparatus constructed in accordance with this invention, and particularly adapted for use on a service counter as a substitute or as an alternative for the soda fountain now in general use. In this preferred form, merely given as an example, the apparatus comprises a vertical hollow pillar secured by screws or otherwise to the top of a counter, and made of ornamental shape and attractively finished, for example, by nickel plating. A water pipe is mounted centrally in this pillar and is connected with the mains through the bottom of the pillar or through the side near the foot, the water either passing direct through the pipe or through a cooler or heater, before flowing to the pipe. Near the top of the pillar the pipe turns horizontally through the wall of the pillar and is fitted with a tap, the outlet of which is directed downwardly. A pressure union or chamber is screwed to the outlet of the tap and extends downwardly, and into it screws a flanged pipe with its side perforated like a bunsen burner. Between these parts, and clamped on a seating in the flanged pipe is a conically dished nozzle which is thus clamped with its aperture at the apex of the cone lying centrally in the pipe. With the apparatus so far described, if the water is turned on, the result is that there is a downwardly directed jet or spray in which the water is finely sub-divided and which moves at a high velocity so as to draw in air laterally, and if this jet is received in a receptacle the water is highly aerated and remains aerated for an appreciable time. It is known, however, that the addition of a second liquid such as spirit or a flavouring juice or syrup enables the mixture to be more highly aerated and for the air bubbles to be maintained for a considerably longer time. The present apparatus, therefore, has an extension tube or bottom nozzle screwed on to the flanged tube. This extension tube is conically reduced in cross-section at its lower end, and below the cone a side tube is fixed to the pipe and has communication with a calibrated container which may be of plated or tinned metal, or of glass, or porcelain. This container is intended to receive a measured amount of fruit juices, syrup, cordial, or spirits, such as whiskey or brandy, and when the controlling valve in the connecting pipe is opened a pre-determined amount of the flavouring liquid flows at a regulated rate by gravity into the vertical pipe and the jet of aerated water impinges upon it,

penetrates it, and mixes the flavouring liquid with water. Below the junction between the vertical pipe and the horizontal pipe, the vertical pipe is extended downwards and at its foot may be fitted with any form of anti-splash device. The result is a blended drink, highly aerated, which may be received in a glass or other receptacle. The blending, atomising, and aeration of the liquids is intensified and completed by the jet stream impinging on the walls of the glass or other receptacle or on the contents or both, combined with the violent agitation set up in the receptacle.

When plain drinking water is aerated the visible air bubbles soon disappear, although if the aerated water is examined under a powerful lens the air is seen in suspension for some time afterwards. If, however, any fruit juice, syrup, cordial, or spirit is introduced the aeration is held for a longer time according to the density and colloidal properties of the blended liquids.

In comparing the method of blending drinks in accordance with this invention with the use of soda water, it must be observed that in the latter case an alkaline solution is added with a considerable amount of carbon dioxide gas which creates a gaseous effervescence. It may be stated that the effect of the soda water with whiskey is to break up the fusel oil, the particles of which become surrounded by carbon dioxide gas, thus nullifying the unpalatable oily taste. With the apparatus in accordance with the present invention, this fusel oil is also broken up, due to the penetrative force and atomising effect of the jet stream, and the particles of the oil are thereby coated with air bubbles. Thus the same physical effect is obtained as with soda water, and the peculiar and somewhat disagreeable taste is overcome. Also, the so-called "gassy" after effect does not occur, as the air in the beverage is very readily absorbed by the human system. Another valuable feature is the refreshing and invigorating effect of a purely air aerated fruit juice, cordial, syrup, or the like, on the human body, compared with soda water, which introduces an excess of chemicals as well as carbon dioxide gas, and causes an enervated condition with subsequent feeling of depression in the system. Further the bouquet and flavour of the beverages blended and aerated with the apparatus of this invention are enhanced to a very marked degree and rendered much more agreeable to the palate than if mixed with either soda water or plain water.

Dated this 28th day of June, 1928.

For the Applicant:

H. A. GILL & Co.,

Chartered Patent Agents,

51/52, Chancery Lane, London, W.C. 2.

COMPLETE SPECIFICATION.

Improvements relating to Apparatus for Aerating and Blending Liquids.

I, JOHN WILLIAM BATTERSBY, a British Subject, of 119, Bishopsgate, London, E.C. 2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to apparatus for aerating and blending liquids, and in particular for aerating water and blending with it some kind of flavouring to make a hot or cold drink. Although primarily the invention is intended to aerate water and to blend with it fruit juices, syrups, essences, cordials, and the like, the invention is equally effective in aerating and blending spirits such as whiskey or brandy with water. The object is to enable such spirits to be aerated and blended with plain water instead of with soda water as has been usual previously, the result being that the drink is rendered more palatable and the flavour is improved.

According to the present invention the liquid, which may be called the flavouring liquid, is admitted at a controlled rate to a conduit preferably in the form of a pipe, and the liquid with which it is to be blended, which may be called the primary liquid, is forced through a nozzle so that it is formed into a sharp jet stream and draws in air through apertures in a suitable position, and in that condition impinges upon the inflowing flavouring liquid, penetrates it and breaks it up. In the preferred apparatus, the primary liquid is forced through a jet consisting of a perforation at the apex of a cone-shaped nipple and arranged centrally in a pipe, the walls of which are perforated to admit air at some distance in front of the aperture; the flavouring liquid is thus blended and aerated and received in a receptacle, usually a drinking glass, through an outlet to the pipe which may be shaped to prevent undue splashing.

The invention will be more clearly

understood from the following description of a form of the novel apparatus adapted for use on a service counter as a substitute for the soda fountain now in general use. This example will now be described with reference to the accompanying drawings, wherein:—

Figure 1 is a side elevation of the whole apparatus; and

Figure 2 is a central section to an enlarged scale of the part of the apparatus in which the blending and aeration takes place.

The apparatus as illustrated, comprises a vertical hollow pillar *a* arranged to be secured to the top of a counter *b* and made of ornamental shape and attractively finished, for example, by nickel plating. A water pipe *c* is mounted centrally in the pillar *a* and is connected with the water mains through the bottom of the pillar *a*, as shown in full lines, or it may be connected through the side of the pillar *a* near the foot, as shown by dotted lines at *d*. The water may either pass direct from the mains to the pipe *c*, or through a cooler or heater before flowing to the pipe *c*.

Near the top of the pillar *a* the pipe *c* turns horizontally through the wall of the pillar and is fitted with a tap *e*, the outlet *f* of which is directed downwardly. A pressure union *g* is screwed to the outlet *f* of the tap *e* and extends downwardly, and into it screws a flanged pipe *h*. The latter is perforated somewhat like a Bunsen burner, and in fact, as illustrated has two pairs of diametrically opposite holes *j* of one-eighth of an inch in diameter. Between the parts *g*, *h* and clamped on to a seating *k* in the flanged pipe *h* is a conical dished nozzle *l* which is thus clamped with its aperture *m* at the apex of the cone lying centrally in the pipe *h*.

With the apparatus so far described, if the water is turned on, a downwardly directed jet or spray is formed from the nozzle *m* in which the water is finally subdivided and which moves at a high velocity so as to draw in air laterally, and if this jet is received in a receptacle, the water would be highly aerated and would remain aerated for an appreciable time.

It is known, however, that the addition of a second liquid, such as spirit or flavouring juice or syrup, enables the mixture to be more highly aerated and allows the air bubbles to be maintained for a considerably longer time. With this in view, the present apparatus has the lower part of the pipe *h* conically reduced in cross-section at *n*, and below the cone a side tube *o* is fixed to the pipe *h* and affords communication with a calibrated container *p* which, as shown, is of plated metal with an observation window *q* and calibrated scales *r*. It may, however, be of tinned metal or of glass or of porcelain. The container *p* is connected to receive a measured amount of fruit juices, syrup, cordial, or spirits such as whiskey or brandy, and the connecting pipe *o* is provided with a controlling valve *s* which when opened, allows the predetermined amount of the flavouring liquid placed in the container *p* to flow under gravity at a regulated rate into the restricted part of the vertical pipe *h*, at which point the jet of aerated water from the nozzle *m* impinges upon the flavouring liquid, penetrates it, and mixes it with water.

Below the junction between the pipe *o* and the pipe *h*, the latter is extended downwards, and at its foot may be fitted with any form of anti-splash device *t*. Between this and the junction with the pipe *o*, a flow adjuster is provided which may be of any desired kind, but is shown, as an example, as an adjustable screw *u* the stem of which is about one half the diameter of the inside of the bottom part of pipe *h*. This adjuster, when desired, may be moved towards or across the centre of the pipe *h* so that the liquid stream will impinge upon the stem, thus causing the blended liquids to be discharged through the outlet of the pipe *h* in a foaming state. The result is a blended drink highly aerated which is received in the glass *v*. The blending, atomising and aeration of the liquids is intensified by the jet stream impinging on the walls of the receptacle *v* or on its contents or both, combined with the violent agitation set up in the receptacle *v*.

It will be realised that where a main water supply is not available for connection to the pipe *c*, water under the necessary pressure could be obtained by connecting the lower end of the pipe *c* to a sealed container fitted with an air pump, or to a hand pump of the beer engine type. Again, of course, the part of the apparatus from the union *g* downwards can be attached to any ordinary domestic water tap for household use.

When plain drinking water is aerated the visible air bubbles soon disappear, although if the aerated water is examined under a powerful lens the air is seen in suspension for some time afterwards. If, however, any fruit juice, syrup, cordial, or spirit is introduced the aeration is held for a longer time according to the density and colloidal properties of the blended liquids.

In comparing the method of blending drinks in accordance with this invention with the use of soda water, it must be observed that in the latter case an alka-

Defendant's Exhibit 4248

line solution is added with a considerable amount of carbon dioxide gas which creates a gaseous effervescence. It may be stated that the effect of the soda water with whiskey is to break up the fusel oil, the particles of which become surrounded by carbon dioxide gas, thus nullifying the unpalatable oily taste. With the apparatus in accordance with the present invention, this fusel oil is also broken up, due to the penetrative force and atomising effect of the jet stream, and the particles of the oil are thereby coated with air bubbles. Thus the same physical effect is obtained as with soda water, and the peculiar and somewhat disagreeable taste is overcome. Also, the so-called "gassy" after effect does not occur, as the air in the beverage is very readily absorbed by the human system. Another valuable feature is the refreshing and invigorating effect of a purely air aerated fruit juice, cordial, syrup, or the like, on the human body, compared with soda water, which introduces an excess of chemicals as well as carbon dioxide gas, and causes an enervated condition with subsequent feeling of depression in the system. Further the bouquet and flavour of the beverages blended and aerated with the apparatus of this invention are enhanced to a very marked degree and rendered much more agreeable to the palate than if mixed with either soda water or plain water.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An apparatus for aerating a liquid and blending with it a liquid flavouring agent, wherein the latter is admitted at a controlled rate to a conduit and the liquid is forced through a nozzle so as to be formed into a sharp jet stream, to draw in air through apertures, and to impinge in that condition, upon the inflowing flavouring agent, with the result that it penetrates the latter, and breaks it up.

2. An apparatus, according to Claim 1, wherein the liquid is forced through a jet consisting of a perforation at the apex of a cone-shaped nipple arranged centrally in a pipe the walls of which are perforated to admit air at some distance in front of the aperture.

3. An apparatus according to Claim 1 or Claim 2, wherein the flavouring agent is allowed to flow at a controlled rate from a calibrated receptacle into the pipe through which the jet of liquid is caused to flow from the nozzle.

4. An apparatus according to Claim 1, 2 or 3, comprising a vertical pipe for connection to a water supply and a conical nipple clamped centrally therein with a calibrated receptacle connected to a reduced portion of the vertical pipe by means of a side pipe including a regulating tap, substantially as described.

5. An apparatus for aerating water and for blending with it a flavouring agent such as a fruit juice, syrup, essence, cordial or spirits, substantially as described with reference to the accompanying drawings.

Dated this 28th day of March, 1929.

For the Applicant:

H. A. GILL & Co.,

Chartered Patent Agents,

51/52, Chancery Lane, London, W.C. 2.

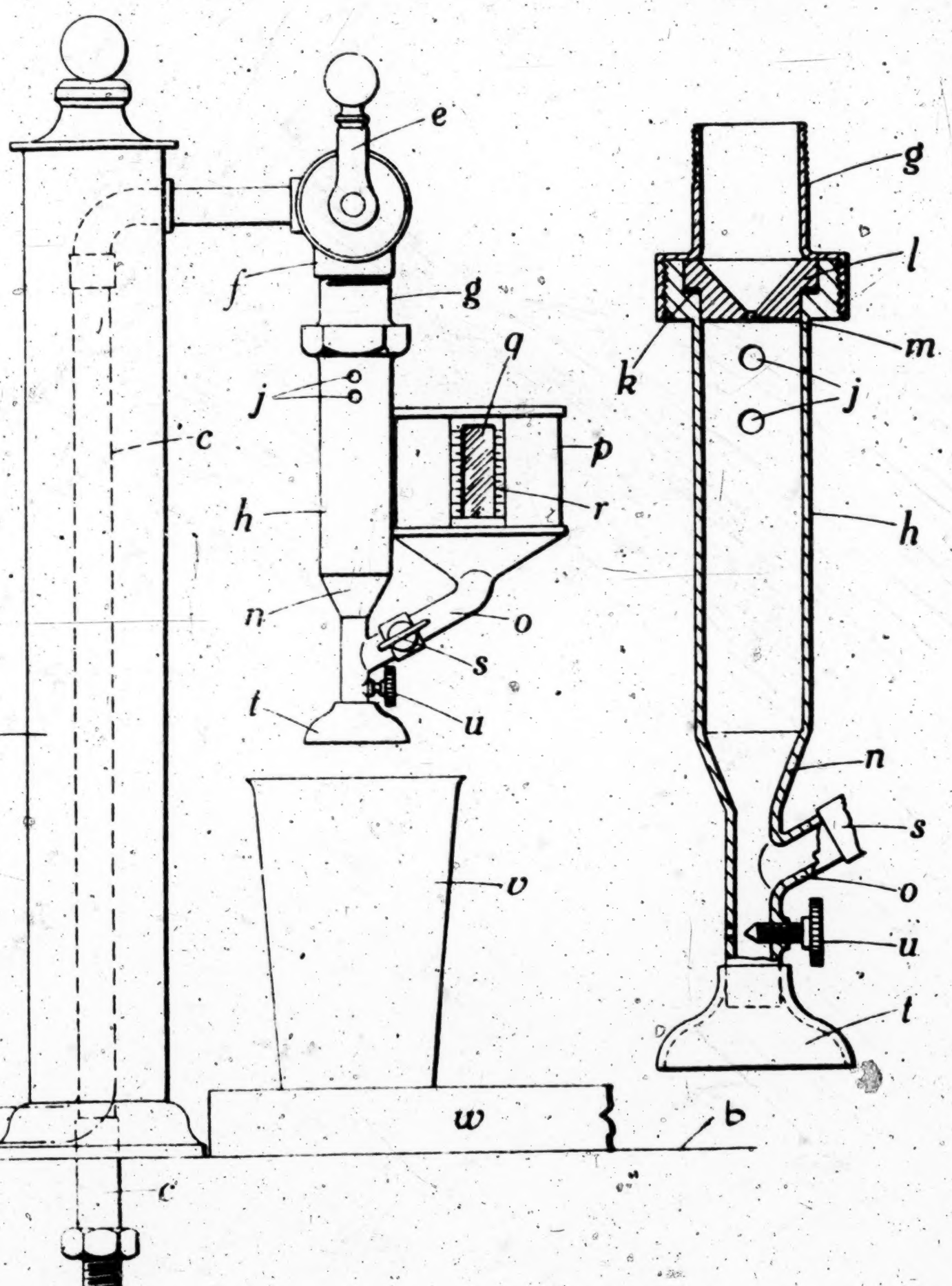
Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1930.

Defendant's Exhibit

323,242 COMPLETE SPECIFICATION 1 SHEET

Fig. 1.

Fig. 2.



[This Drawing is a reproduction of the Original on a reduced scale]

Defendant's Exhibit 44-10

2 App. 289

[Page 288 is blank]

PATENT SPECIFICATION

405,316

Application Date: Aug. 3, 1932. No. 21,752/32.

" " Aug. 27, 1932. No. 24,024/32.

One Complete Left: Aug. 1, 1933.

Complete Accepted: Feb. 5, 1934.

PROVISIONAL SPECIFICATION.

No. 21,752, A.D. 1932.

An Improved Device for Aerating a Liquid after it has Passed Through the Nozzle of a Tap.

I, Louis Solomon, 55, High Street, Plaistow, E. 13, London, English, do hereby declare the nature of this invention to be as follows:—

This invention relates to tap nozzles, and more especially to those used upon the spouts of beer engines and the like, and for the specific purpose of mixing air with the liquid in passing through them, and producing a foam froth or lather.

The object of the present invention is to provide a device whereby air is drawn into the liquid in its passage through the said device.

The invention consists of a cylinder of suitable length and circumference, about one half of its length being hollow and the remaining half solid. The solid portion is pierced with a number of longitudinal holes half of which are bored from the inside and are blind, that is they are not bored through, and the others are bored from the outside end and taken right through. The blind holes that are drilled from the inside are now connected with holes bored through the sides of the cylinder to allow of the ingress of the air. About half way down in the hollow portion a number of pegs are inserted through the wall of the cylinder, of a suitable length, the points of the said pegs converging on to the centre of the cylinder and being placed directly in line with the said longitudinal holes that are bored right through.

In operating the device the liquid passes through the set of holes that are bored right through, each stream being broken upon a point, or end, of the projecting peg, so that turbulent flow is assured, and the liquid is thereby mixed with the air that is drawn in through the other set of holes, which have their inlets from the circumferential wall of the cylinder, and consequently the liquid and air are thoroughly mixed before emerging from the open end of the device.

Dated the 3rd day of August, 1932.

LOUIS SOLOMON.

PROVISIONAL SPECIFICATION.

No. 24,024, A.D. 1932.

An Improved Device for Aerating a Liquid after it has Passed Through the Nozzle of a Tap.

I, Louis Solomon, of 55, High Street, Plaistow, London, E. 13, English, do hereby declare the nature of this invention to be as follows:—

The invention relates to taps, more especially the taps used on beer engines, and to a device by means of which air may be drawn into the device for the purposes of aerating liquids passing through the device and producing a foam or froth.

The invention is cognate to or a modification of the invention described in the Provisional Specification of my Application for Letters Patent No. 21,752 dated August 3rd 1932.

The invention described in said Provisional Specification consists of a device adapted to be connected by a length of rubber tubing to the nozzle of a tap or the like. This device is constructed of a cylinder of suitable length and diameter about one half of which, the lower half, is hollow whilst the remainder or upper part of the cylinder is solid. Said solid part is provided with a suitable number of longitudinally disposed passages one

half of which passages are bored from the interior of the cylinder and are blind at their upper ends, that is to say terminate short of the upper end of the cylinder, whilst the other passages, which are alternately disposed with respect to said first mentioned passages, extend from end to end of the solid part of the cylinder. Short passages communicating with the inner parts of said blind passages are drilled in the sides of the cylinder to allow air to pass into said blind passages. The walls or sides of the lower or hollow part of the cylinder are further provided at a suitable distance below the upper solid part of the cylinder with holes into which are driven pegs of suitable length which converge towards the centre line or axis of the cylinder and are transversely disposed with respect to the passages that extend from end to end of the solid part of the cylinder, and serve as a means for breaking up the liquid as it emerges from the lower ends of said passages.

The device operates as follows:—

When a tap provided with the device is opened liquid will flow through the set of passages that extend from end to end of the solid part of the cylinder and will impinge on the transversely disposed pegs of the device causing turbulence of the liquid. At the same time air will be drawn through the other set of passages provided in the solid part of the cylinder of the device and become mixed with the liquid.

According to the present invention the device, especially when it is intended to be used with the spouts of the taps of beer engines, is provided with means for preventing dripping. Said means may be located in either the upper part of the device or in any other part of the device. When located in the upper part of the device the solid part of the cylinder of the device may be formed with a cylinder open at its upper end in which works a floating piston that is constantly pressed by means of a light coiled spring against the lower surface of a plate which is secured in the upper end of the device and is formed at its centre with a hole of lesser diameter than said piston, whilst throughways for the passage of liquid through the device are formed in the sides of the cylinder in which said piston works, passage of liquid through said throughways obtaining as soon as the liquid passing through the nozzle of a tap provided with the device impinges on to and depresses said piston, and dripping from the device being prevented when said coiled spring by reason of lack of pressure of liquid on the top of said piston is free to press said piston against the lower surface of the plate secured to the upper end of the device. Alternatively drip preventing means for use with the device of the present invention may be located intermediate the ends of the cylinder of the device. In this case the drip preventing device may consist of a disc which is adapted to co-operate with a seating formed in the interior of the lower or hollow part of the cylinder of the device and is connected by means of a rod to a piston that works in a cylinder provided in the solid or upper part of the cylinder of the device. Said piston is constantly pressed upwards by means of a light spring interposed between the lower surface of the piston and the bottom of the cylinder in which the piston works. A drip preventing device for use with the device of the present invention may be constructed in other ways than those described above which are merely given by way of example.

Dated the 27th day of August, 1932.

C. F. ENNIS,
Registered Patent Agent,
Jessel Chambers, 88, Chancery Lane,
W.C. 2.
For the Applicant.

COMPLETE SPECIFICATION.

An Improved Device for Aerating a Liquid after it has Passed Through the Nozzle of a Tap.

I, Louis Solomon, of 55, High Street, Plaistow, London, E. 13, English, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to a device, adapted to be connected to the nozzles of taps, particularly the nozzles of beer taps and the nozzles of beer engines, by means of which liquid after it has passed through a nozzle will be aerated and a foam or froth produced.

The device, which is adapted to be connected by a length of rubber tubing to the nozzle with which it is to be used, is constructed of a cylinder of suitable length and diameter about one half of which, the lower half, is hollow, whilst the re-

mainder or upper part of the cylinder is solid. Said solid part is provided with a suitable number of longitudinally disposed passages. One half of these passages serve as throughways for the liquid and extend from end to end of the solid part of the cylinder. The other half of the passages, which are alternately disposed with respect to said first mentioned passages, extend only part of the way upwards through the solid part of the cylinder and communicate at their upper ends with the atmosphere in order that air may be drawn into the cylinder as the liquid passes through the latter. These last mentioned passages may consist of passages which are drilled from the interior of the cylinder and are blind at their upper ends, that is to say terminate short of the upper end of the solid part of the cylinder, and of short passages which are drilled in the sides of the cylinder and communicate at their inner ends with the inner ends of said blind passages, or may consist of single passages drilled at a suitable angle to the axis of the cylinder and communicating at their upper ends with the atmosphere and at their lower ends with the lower hollow part of the cylinder. The walls or sides of the lower or hollow part of the cylinder are provided at a suitable distance below the upper solid part of the cylinder with holes into which are driven pegs of suitable length which converge towards the centre or axis of the cylinder and are transversely disposed with respect to the passages that extend from end to end of the solid part of the cylinder, and serve as a means for breaking up the liquid as it emerges from the lower ends of said passages.

A device constructed as above described may when it is to be used with the nozzles of beer engines, be provided with means for preventing dripping of liquid when the device is not in use. Such drip preventing means may be of the constructions hereinafter described or of any other suitable construction.

The passages above referred to as extending from end to end of the upper solid part of the cylinder of the device may, so long as they constitute in conjunction with the remainder of the upper part of the cylinder throughways for the passage of liquid, extend only partially through the upper part of the cylinder. Examples of such shorter passages may obtain when, as aforesaid, the device of the present invention is provided with means for preventing dripping of liquid.

The invention is illustrated by the accompanying drawings.

Figs. 1 to 5 illustrate the device as it may be constructed when it is to be used with the tap of a beer barrel, Fig. 1 being an outer view of the device, Figs. 2 and 3 vertical sections of the device taken through the centres of two of the passages through which air is drawn into the device and through the centres of two of the passages for the liquid, and Figs. 4 and 5 a plan and an inverted plan of the device.

Figs. 6 to 11 and Figs. 12 to 17 illustrate two embodiments of the device as it may be constructed when the device is to be used with nozzles of beer engines, the device being then provided with means for preventing dripping of liquid. Of these figures, Fig. 6 is an outer view of the first of these devices, Figs. 7 and 8 are vertical sections taken through the centres of two of the passages through which air is drawn into the device and through the centres of two of the passages for the liquid. Figs. 9 and 10 are a plan and an inverted plan of the same device, and Fig. 11 is a further plan of the device, the disc at the upper end of the device, the piston of the means for preventing dripping of liquid and the spring acting on said piston being removed. Fig. 12 is an exterior view, Figs. 13 and 14 are vertical sections, and Figs. 15, 16 and 17 are plans, corresponding to Figs. 6, 7 and 8 and Figs. 9, 10 and 11 respectively, illustrating the second of the devices above referred to as being provided with means for preventing dripping of liquid.

Referring first to the construction of device illustrated by Figs. 1 to 5, 1 is the cylinder of the device, 2 is the upper solid part of the cylinder 1, and 3 is the lower hollow part of the cylinder. 4 are passages which extend from end to end of the solid part of the cylinder 1, whilst 5 are passages which are disposed alternately with the passages 4 and terminate short of the top of the solid part 2 of the cylinder. 6 are short passages drilled in the sides of the cylinder 1 so as to communicate with the upper ends of the passages 5, and thereby allow air to pass into the passages 5. 7 are holes in the sides of the hollow part 3 of the cylinder 1 into which are driven pegs 8 which converge towards the centre or axis of the cylinder 1 and are transversely disposed with respect to the passages 4, and serve as a means for breaking up liquid after it has emerged from the lower ends of these passages. 9 indicates part of a length of rubber tubing by which the device may be attached to the nozzle of a beer tap.

The device operates as follows:—

When a tap provided with the device is opened liquid will flow through the set of passages 4 that extend from end to end of

the solid part 2 of the cylinder 1 and will impinge on the transversely disposed pegs 8, causing turbulence of the liquid. At the same time air will be drawn through the other set of passages 5 and become mixed with the liquid, thereby aerating same and causing a foam or froth to be formed on the upper part of the liquid when the latter is drawn off into a glass or vessel placed below the device.

As previously mentioned a device constructed as above described may be provided with means for preventing dripping of liquid from the device when the latter is not in use.

Said means may consist of the additional parts illustrated in Figs. 7 and 8 and now to be described. As shown in these figures the upper solid part 2 of the cylinder 1 of the device may be formed with a cylinder 10 open at its upper end in which works a floating piston 11 that is constantly pressed by means of a light coiled spring 12 against the lower surface of a disc 13 which is removably secured in the top of the cylinder 1 of the device, by being sprung into position, and is formed at its centre with a hole 14 of lesser diameter than the piston 11, whilst throughways 15, corresponding to the through passages 4 of the device illustrated by Figs. 1 to 5, are formed at the sides of the cylinder 10 in which the piston 11 works. With this construction and arrangement of parts passage of liquid through the throughways 15 will obtain as soon as the liquid passing through the nozzle of a tap provided with the device impinges on and depresses the piston 11, dripping from the device being prevented when the coiled spring 12 by reason of lack of pressure on the top of the piston 11 is free to press the latter against the lower surface of the disc 13.

Referring now to the somewhat modified construction and arrangement of parts for preventing drip illustrated by Figs. 13 and 14, the piston 11, instead of working in and being guided by a cylinder formed in the upper part of the device, may be secured to a rod or spindle 16 which is supported at its lower end in a guide 17 formed in a diaphragm 18 that constitutes the bottom of the upper part 2 of the cylinder 1 of the device and is formed with throughways 19 for the passage of the liquid. The upper part 2 of the device is either fitted with a disc, similar in all respects to the disc 13 shown in Figs. 7 and 9, or with a plug 20 of the construction shown in Figs. 13 and 14, that is to say a plug which is made hollow for the greater part of its length, snugly fits a bore 21 formed in the upper part 2 of the cylinder 1, is provided at its centre with a hole 22 of lesser diameter than the piston 11, and is formed with a shoulder 23 adapted to bear, when the plug is pushed home, against the top of the cylinder 1 of the device. The light coiled spring 24 by which the piston 11 is pressed upwards against the top of the hollow part of the plug 20, or against the lower surface of the equivalent disc, if such be used, is interposed between the lower surface of the piston 11 and a washer 25 which bears against the diaphragm 18 and serves as an additional guide for the rod or spindle 16. For the purpose of preventing the coiled spring 24 and the washer 25 from becoming detached from the rod or spindle 16 when the piston rod and spring are removed from the device for the purpose of cleaning the lower part of the rod 16 is, as shown, made of greater diameter than the rest of the rod so as to provide a shoulder 26 against which the washer 25 will bear when said parts are removed. The drip preventing device just described acts in the same way as the drip preventing device illustrated by Figs. 7 and 8.

Means for preventing dripping of liquid for use with the aerating device of the present invention may, so long as it consists of a valve adapted to be normally pressed by a spring against a seating but to be depressed by the passage of liquid through the device, be constructed in other ways than those described above, which are merely given by way of example.

If desired the passages through which air is drawn into the device, instead of being formed of two parts, 5, 6, disposed at right angles to one another, may consist of single passages drilled at a suitable angle to the axis of the cylinder of the device and communicating at their upper ends with the atmosphere and at their lower ends with the lower hollow part 3 of the cylinder.

For the purpose of preventing an objectionable flavour being imparted to a liquid in its passage through the aerating device the latter is preferably constructed of ebonite, whilst the springs used in the anti-dripping devices are made of silver wire.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be carried out I declare that what I claim is:—

1. An improved device for aerating a liquid, after it has passed through the nozzle of a tap, consisting of a cylinder adapted to be connected to the nozzle by a length of rubber tubing and comprising a lower hollow part and a relatively solid

405,316 COMPLETE SPECIFICATION

SHEET 1

[This Drawing is a reproduction of the Original on a reduced scale.]

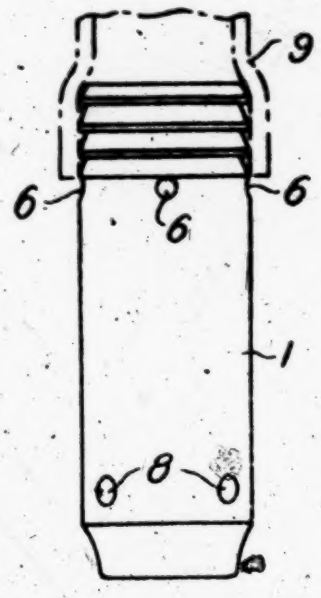


FIG. 1.

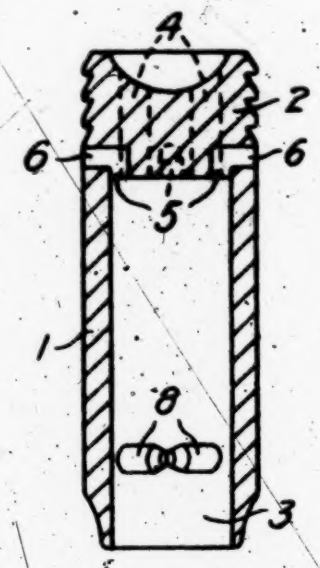


FIG. 2.

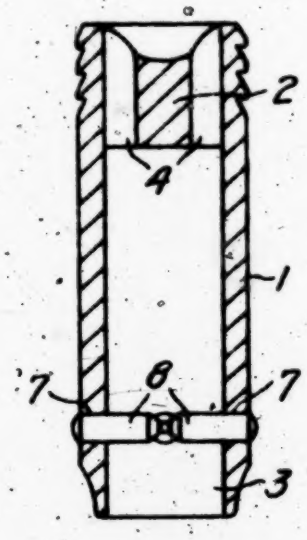


FIG. 3.

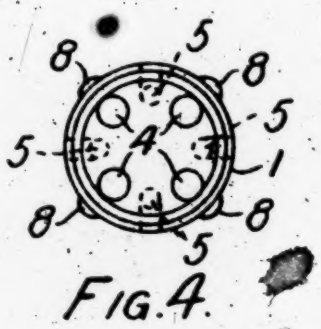


FIG. 4.

FIG. 5.

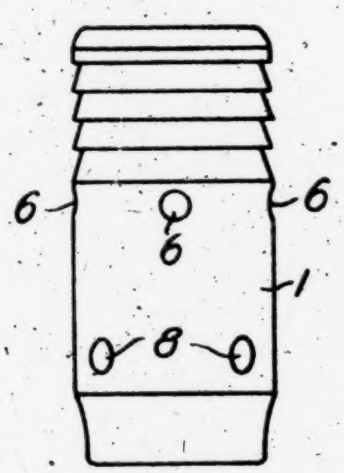


FIG. 6.

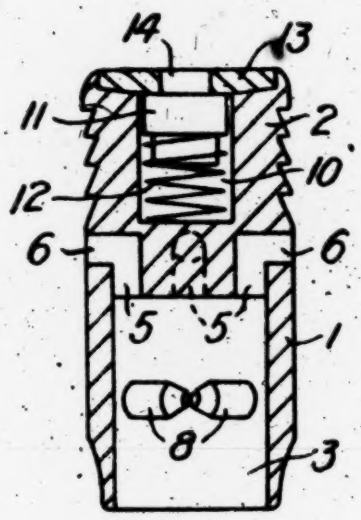


FIG. 7.

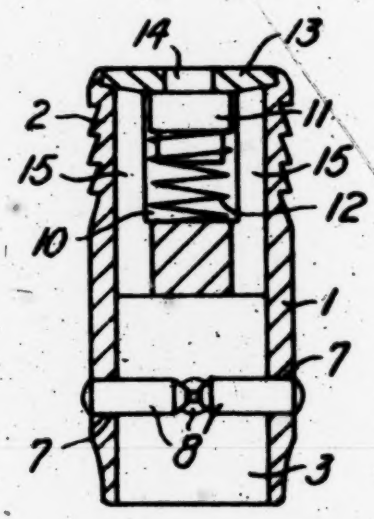


FIG. 8.

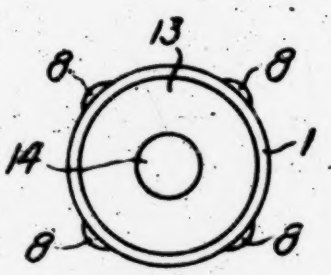


FIG. 9.

FIG. 10.

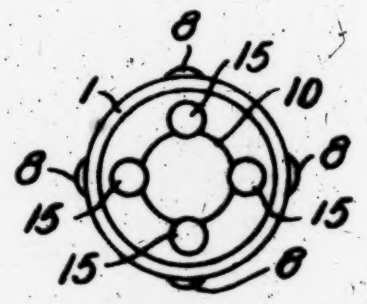


FIG. 11.

Defendant's Exhibit 44-10

2 App. 295

2 SHEETS

SHEET 2

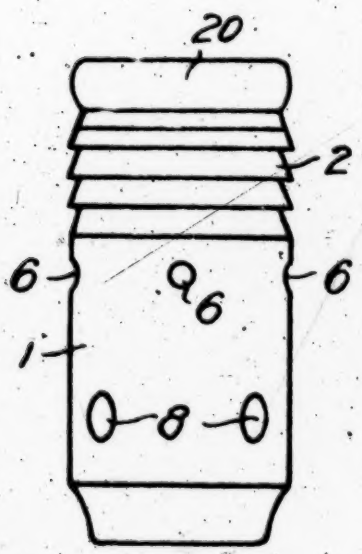


FIG. 12.

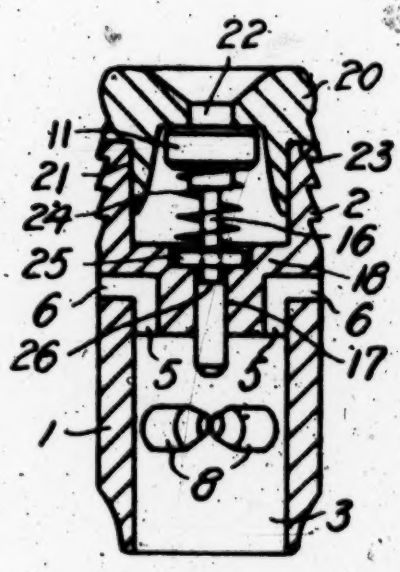


FIG. 13.

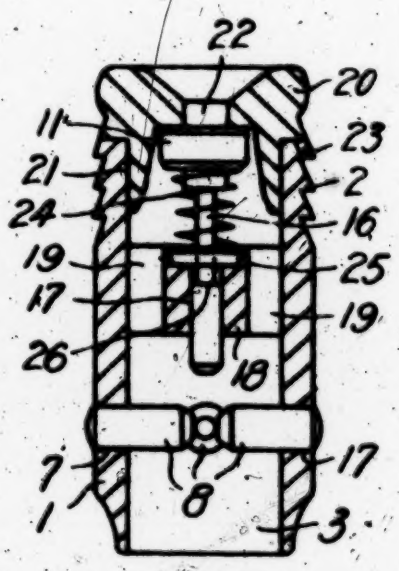


FIG. 14.

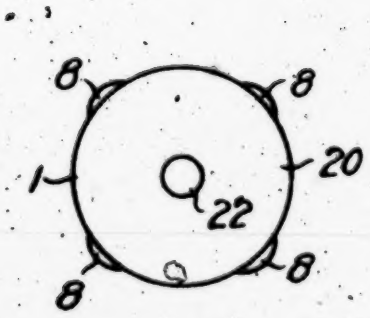


FIG. 15.

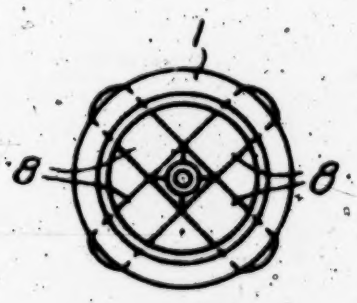


FIG. 16.

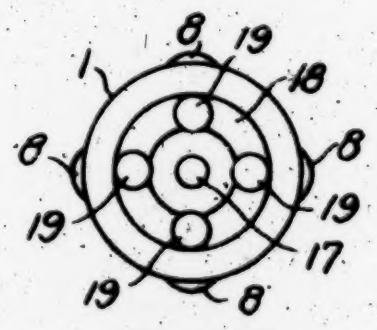


FIG. 17.

Malby & Sons, Photo-Litho

upper part, passages in said relatively solid part serving as throughways for the liquid, passages, alternating with said throughways, which extend only partly through said relatively solid upper part and communicate at their outer ends with the atmosphere, and pegs supported by the hollow part of the cylinder of the device in positions below and transverse to said throughways, substantially as described.

2. A device according to Claim 1 which is provided with means for preventing dripping of liquid, substantially as described.

3. A device according to Claim 2 in which the means for preventing dripping of liquid consists of a piston which works in a cylinder or space provided in the relatively solid upper part of the cylinder of the device and is constantly pressed by means of a light coiled spring against a disc or a plug that is located in the upper end of the cylinder of the device and is provided at its centre with a hole of lesser diameter than said piston, substantially as described.

Dated this 31st day of July, 1933.

C. F. ENNIS,
Jessel Chambers, 88, Chancery Lane,
London, W.C. 2,
Agent for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1934.

(Page 296 in Issue)

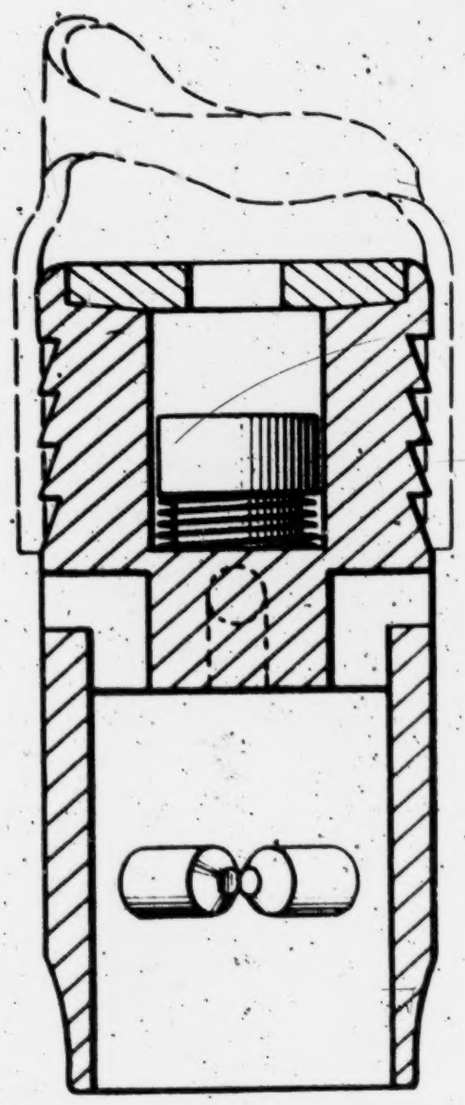


FIG. A

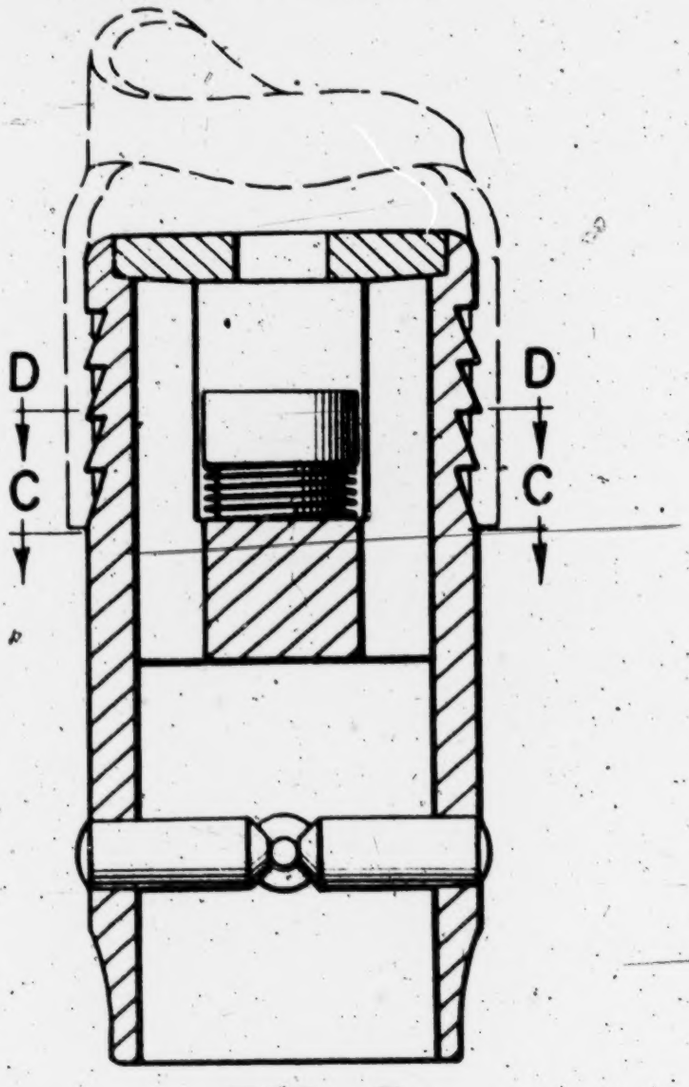


FIG. B

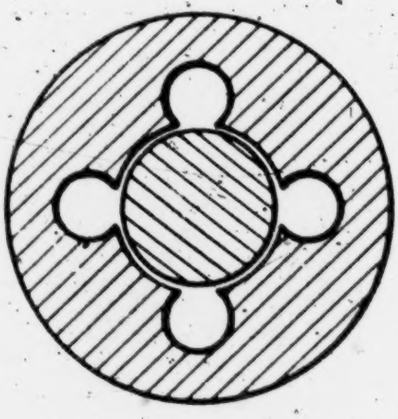


FIG. D

SOLOMON'S FIGURES 7 & 8
AND SECTIONS THEREOF

Exemplitive Drawing Of Solomon's Figures 7 & 8, And Of Sections C. And D Thereof, With Valve Member Depressed, As It Would Be When Liquid Is Flowing Through Aerator.

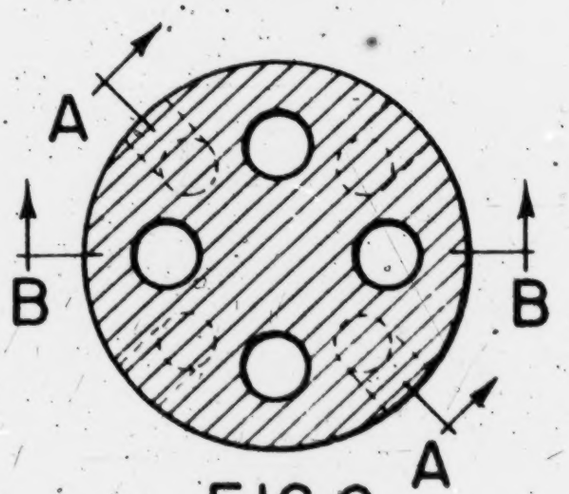


FIG.C

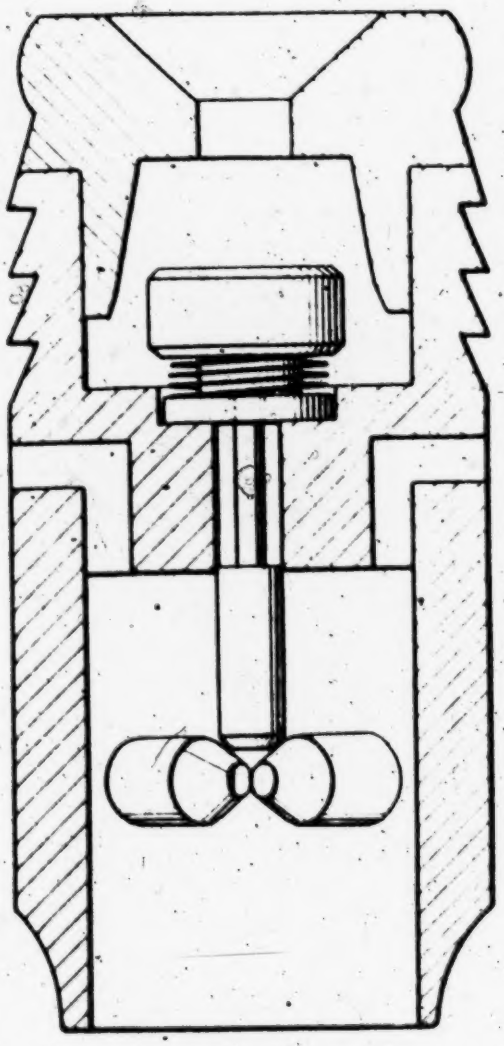


FIG. 13

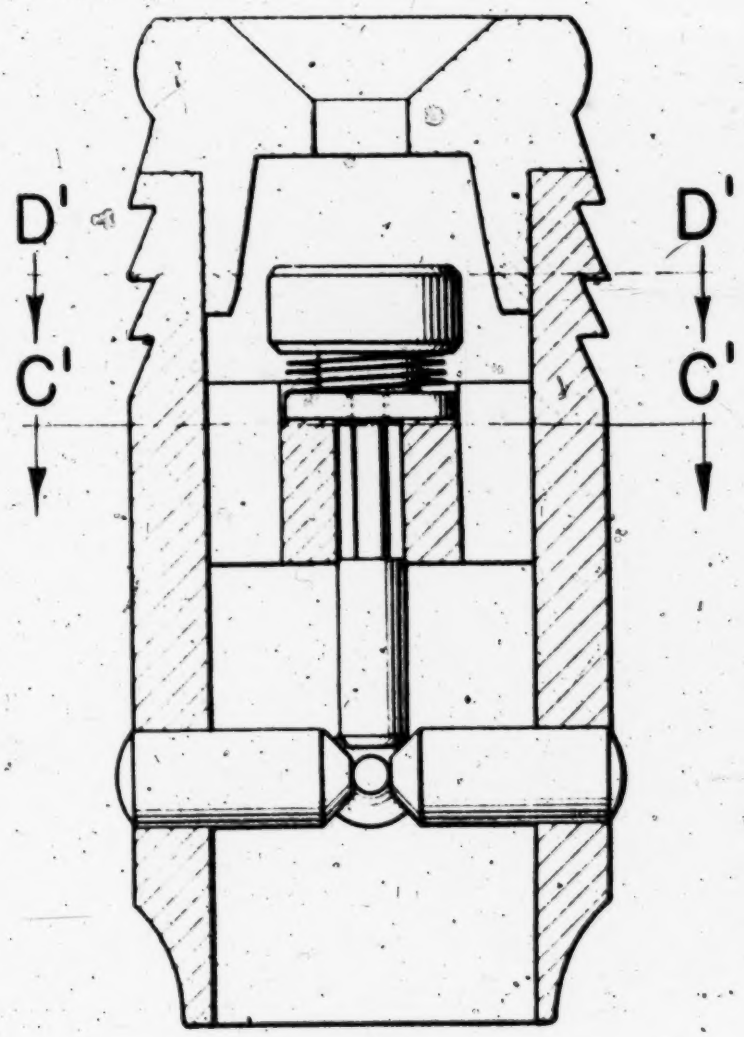


FIG. 14

SOLOMON'S FIGURES 13 & 14
AND SECTIONS THEREOF

Exemplitive Drawing Of Solomon's Figures 13 & 14, And Of Sections C' And D' Thereof, With Valve Member Depressed, As It Would Be When Liquid Is Flowing Through Aerator.

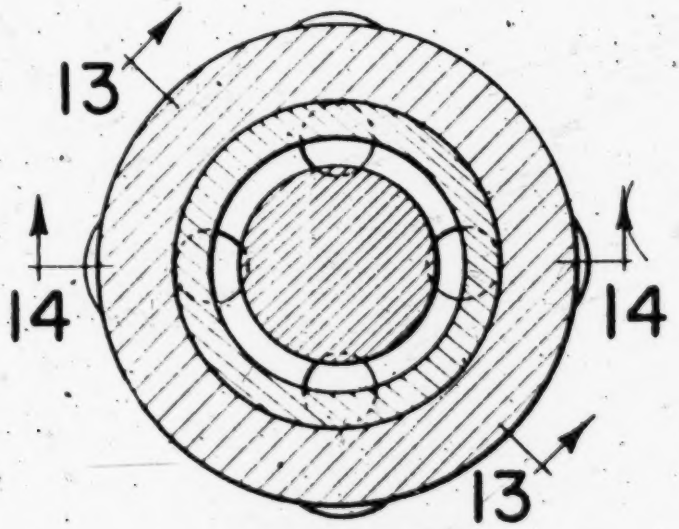


FIG. D'

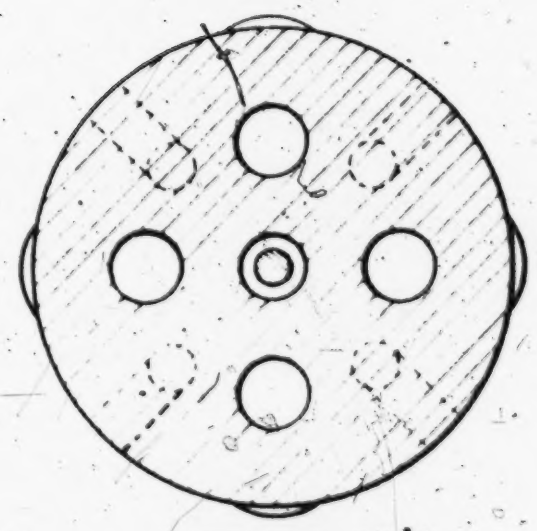


FIG. C'

Defendant's Exhibit 44-11 2 App. 299

M. FUSS.

SYSTEM FOR TREATING LIQUIDS WITH OZONE.

APPLICATION FILED APR. 9, 1909.

1,090,044. Patented Mar. 10, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

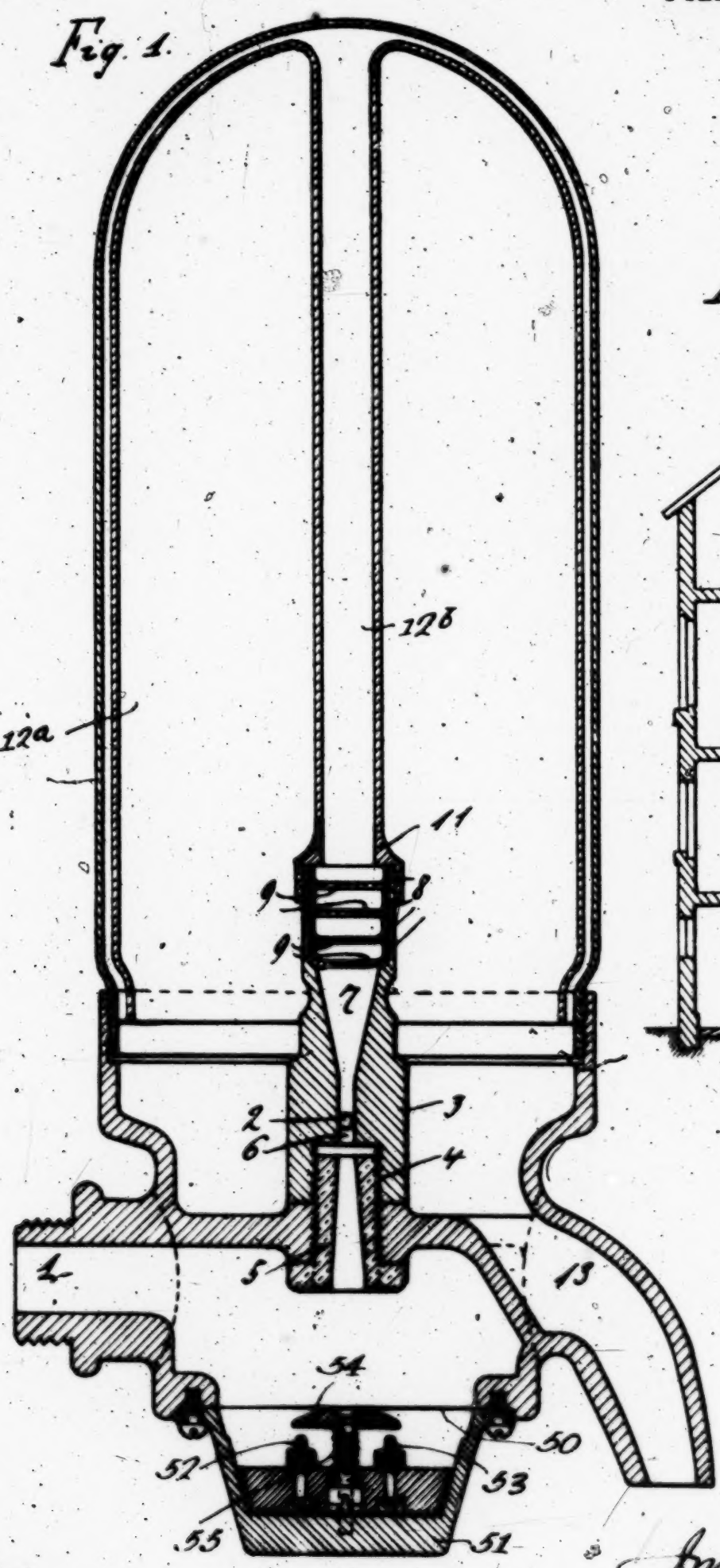
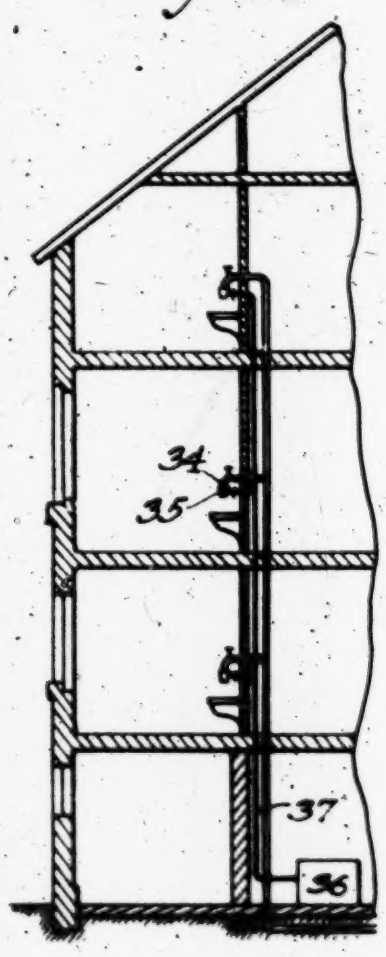


Fig. 8.



Witnesses:
J. J. McCarthy
M. G. Crandell

Inventor:
Max Fuss
by Foster Freeman Watson & Coit
Attorneys

Defendant's Exhibit 44-11

UNITED STATES PATENT OFFICE

MAX FUSS, OF FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM FOR TREATING LIQUIDS WITH OZONE.

1,090,044. Specification of Letters Patent. Patented Mar. 10, 1914.

Application filed April 9, 1909. Serial No. 488,001.

To all whom it may concern:

Be it known that I, MAX FUSS, a subject of the German Emperor, and a resident of Frankfort-on-the-Main, Germany, have invented certain new and useful Improvements in Systems for Treating Liquids with Ozone, of which the following is a specification.

This invention relates to improvements in systems for treating liquids with ozone for the purpose of oxidation and destruction of germs, and the object of the improvements is to provide a system by means of which such oxidation and destruction of germs takes place in a particularly effective way. As is well known, in systems of this class heretofore in use the effect of the ozone on the liquid was not sufficient for all purposes, because generally not all the germs were destroyed. The reason for the inefficiency of the systems appears to reside in the fact, that the liquid to be treated with ozone is generally brought in contact with the ozone when flowing in a single jet, so that not all of its particles come in thorough contact with the ozone.

This invention consists in providing a system, in which the liquid when treated with the ozone is so distributed as to present a large surface to the ozone, for which purpose it is discharged in thin jets or in the form of fine drops.

For the purpose of explaining the invention a system embodying the same has been shown in the accompanying drawings, in which—

Figure 1, is a vertical section of an apparatus for treating liquid with ozone, Fig. 2, is a cross-section of a portion of Fig. 1 showing the apparatus for distributing the liquid in a fine jet and for mixing ozone therewith, Figs. 3 to 5 are respectively plans and a side view of one member of the distributing apparatus shown in Fig. 2, Fig. 6 is a side elevation, partly in section, of an apparatus embodying the invention and differing slightly from the form shown in Fig. 1; Fig. 7, is a front view of the ozonizer or apparatus for generating the ozone required in the process, and Fig. 8, is a side view of a system comprising a plurality of apparatus for mixing the ozone with liquid connected to a single source of ozone.

In the example of the system for treating a liquid with ozone illustrated in the drawings, the apparatus for mixing the ozone and liquid is provided with a tubular plug 1, whereby it can be connected to a suitable water supply, for example to a faucet of the water system of a building. From the said plug, the liquid passes through a suitable mixing apparatus, in which it is divided into fine streams. Into the said mixing apparatus the ozone is drawn through apertures 2 by the suction of the stream of liquid. As appears more clearly from Fig. 2, the mixing apparatus consists of a tube 3 having a transverse opening adapted to act as an injector or an ejector. The tube has screwthreaded engagement with a tubular plug 5 through which the liquid is admitted to the mixing apparatus. The liquid passes through the bore 6 of the tube 3 and draws in the ozone through the opening 2, and it flows with the same into the conical part 7 of the bore of the stud 3, the walls of which flare outwardly beyond the opening 2, so that the ozone is drawn in by the liquid, a partial vacuum being created within the suction duct 2.

Within the upper part of the chamber 7, in the form illustrated in Fig. 1, a plurality of superimposed perforated cup shaped disks 8 are located. The disks are provided with perforations 9, which, when the disks are assembled in the chamber 7, are off-set from each other, and the disks are held in place by teeth 10 provided on upwardly projecting flanges of said disks and engaging in notches 9 of the adjacent disks. The plates are secured in place by means of a cap nut 11.

As the liquid passes through the opening 9 in the disk 8, it is divided into a plurality of jets and is several times deflected from its course, so that it passes through the chamber filled with ozone in a state of fine distribution, whereby it is thoroughly mixed with the ozone.

In order to keep the liquid as long as possible in contact with the ozone, so that the ozone is entirely absorbed by the liquid, the liquid is not directly discharged into the atmosphere, after being mixed with the ozone in the chamber 7 in the manner described, but into a receptacle 12 located above the mixing apparatus. The said receptacle is so constructed, that the jet of liquid, by being thrown against the wall of the receptacle, is formed into a thin layer

Note

Page 300 is blank;
Page 301 is on Card 20;
Page 302 is blank.

Defendant's Exhibit 44-11

or into fine drops flowing down the wall of the receptacle and through an atmosphere of ozone before it is discharged through the spout 13.

As shown the receptacle 12 is provided with an inner shell 12^a, having a central tube 12^b which communicates with the nozzle member 11. By this arrangement of parts the liquid is caused to travel in a thin sheet or series of thin drops through the relatively narrow space separating the outer wall of the casing 12 and the inner shell 12^a thereof.

The ozonizer or apparatus for generating the ozone which is preferably used in the improved system consists of plates forming electrodes and dielectric plates or disks interposed between said electrodes. The said apparatus is thrown into operation by means of a switch controlled by the pressure of the liquid to be subjected to the influence of the ozone. In the embodiment of the invention illustrated in Fig. 1 such switch is located below the mixing device hereinbefore described and comprises a diaphragm 50 clamped between the main casting or body of the device and a depending support 51. On said support are suitably mounted terminals 52, 53 of an electric circuit, and above these is arranged a circuit closing plate 54 which is maintained in contact with the diaphragm by action of a spring 55. When liquid is not passing through the supply duct the spring 55 acts to lift the circuit closer 54 and diaphragm 50 into the position shown in the drawing, in which said plate is out of contact with the terminals 52, 53. The pressure of liquid passing through the device, however, will operate to depress the diaphragm and circuit closer to set in operation the apparatus for generating ozone which will be conducted to the mixing device through the duct 2, as previously described. In the preferred form of the system, however, the electrical apparatus of the ozonizer is entirely separated from the conduit for the liquid, so that the electrical apparatus can not be injured by the liquid, and the mixing apparatus can not be charged with electricity. For this purpose, the switch is located on the ozonizer or within the casing of the same, so that the electrical part of the system is entirely separated from the mixer. The connection between the switch and the liquid is made by a tube transmitting the vacuum created by the liquid to the switch controlling device and serving at the same time as a duct for the ozone from the ozonizer into the mixing apparatus. An example of this part of my invention is shown in Figs. 6 and 7. The ozonizer is inclosed within a casing 14. The duct for transmitting the ozone to the mixing apparatus consists of channels 15, 16, 17 and a tube 18. Between the channels 16 and 17 a valve 19 is located which is normally pressed by a spring 20 against its seat, while it bears with its upper surface against a diaphragm 21. The valve is made with ports 23 and 24 and with openings 25 located perpendicularly to the latter. On the upper surface of the diaphragm a spring arm is supported which at its free end holds a contact 26 above a contact 27. The duct 15, 16, 17, and 18 communicates with the ejector 3, 11 which in the example illustrated is located at the discharge side of the faucet 28.

In the embodiment of the invention illustrated in Fig. 6, the chamber 12 of the form shown in Fig. 1 is omitted, and the mixing tube opens downward, or in the direction represented in Fig. 2.

The operation of the apparatus is as follows: When the valve on the faucet 28 is opened, the jet of liquid passing through the ejector 3, 11 creates a partial vacuum within the suction ducts 18 and 17. Therefore the atmospheric pressure on the diaphragm 21 causes the valve 19 to be moved from its seat against the action of the spring 20, so that the port 23 is brought into communication with the duct 16. Thereby the sections 15 and 16 of the suction duct communicate with the sections 17 and 18, and the contacts 26 and 27 are closed, so that the apparatus for producing the ozone is thrown into operation. If now for any reason after opening the valve on the faucet 28 the pressure within the suction duct 15, 16, 17, and 18 be not decreased as before described but increased, and if part of the liquid be forced through said duct and toward the ozonizer, the valve 19 is pressed on its seat not only by the spring 10 but by the pressure of the liquid within the suction duct, so that the ozonizer is shut off from the liquid supply.

In the apparatus for producing ozone just described, in which plain disk electrodes and interposed dielectric plates are used, the discharge of the electricity takes place without interruptions and in the form of layers. In apparatus of this class it is difficult to hold the plates at the proper distances from one another, without unduly choking the passage of the air to be transformed into ozone, and to decrease the fields of the discharge. Therefore the metallic plates and the dielectric plates are held in their proper relation by means of small projections on the said plates.

By the construction of the switch and its controlling devices so far described and illustrated in Figs. 6 and 7 of the drawings the liquid is entirely separated from the ozonizer and its electrical apparatus. As appears from Fig. 8, the same ozonizer can be provided for a plurality of mixing devices. As shown in the said figure, each of the faucets 34 is provided with a mixing ap-

N° 12,345 A.D. 1898

Date of Application, 1st June, 1898

Complete Specification Left, 25th Feb., 1899—Accepted, 1st June, 1899

PROVISIONAL SPECIFICATION.

An Improved Attachment for Cocks and the like for Ensuring an Even Flow of the Liquid therefrom.

I, WATRIN VIELHARD, of 63, Rue Mazel, Verdun (Meuse), in the Republic of France, Ironmonger, do hereby declare the nature of this invention to be as follows:—

This invention relates to a small appliance which I term a "jet-breaker" and which may be adapted to cocks or nozzles for the flow of water or other liquids, for the purpose of regulating the flow and more particularly for preventing the liquid from splashing.

This appliance consists essentially of a small box made in two parts which are united; in this box are arranged one or more perforated metal sheets. The box is connected on one side to the nose of the cock or nozzle either directly by screwing, brazing or soldering, or by means of an india-rubber tube.

The liquid, flowing under pressure or simply owing to its weight, traverses the metal sheet or sheets, where it is filtered and broken up so to speak, and then flows out in the form of a regular column which does not splash.

In applying my device to the nozzle of a cock by soldering brazing or by other suitable means, the body of the device is made in two parts which are screwed one upon the other, the upper part terminating in a tube which is intended to surround the nozzle of the cock, whilst the lower part or grating terminates in a more or less conical nozzle or adjutage and is provided with a shoulder upon which rest one or more perforated metal sheets or plates which are forced into the device.

In order to clean or remove the perforated metal sheets, it is only necessary to unscrew the lower part of the device which is provided with an external milled band for this purpose.

The water under pressure issuing from the cock fills the chamber formed by uniting the said two parts, passes through the metal sheets where it is filtered and where the jet is broken up, it then passes out in a regular column and falls without causing any splashing.

When the device is adapted to be removably connected with the cock by means of an india rubber tube it acts in precisely the same manner.

The perforated sheets may be equally well cleaned or removed in this case also.

The grating may be screwed upon the upper part, but the perforated metal sheets are set in this grating. The said sheets may however be cleaned when desired as also the whole of the jet-breaker.

Dated this 1st day of June 1898.

HASELTINE, LAKE & Co.,
45, Southampton Buildings, London, W.C., Agents for the Applicant.

[*Price 8d.*]

N° 12,345.—A.D. 1898.

Attachment for Cocks &c., for Ensuring an Even Flow of the Liquid therefrom.

COMPLETE SPECIFICATION.

An Improved Attachment for Cocks and the like for Ensuring an Even Flow of the Liquid therefrom.

I, WATRIN VEILLARD, of 63, Rue Mazel, Verdun (Meuse), in the Republic of France, Ironmonger, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a small appliance which I term a "jet-breaker" and which may be adapted to cocks or nozzles for the flow of water or other liquids, for the purpose of regulating the flow and more particularly for preventing the liquid from splashing.

This appliance comprises essentially two parts which are united together; one of these parts is provided with one or more perforated metal sheets, and the other is connected to the nose of the cock or nozzle, either directly by pressure, screwing, brazing or soldering, or by means of an india-rubber tube.

The liquid, flowing under pressure or simply owing to its weight, traverses the metal sheet or sheets, where it is filtered and broken up so to speak, and then flows out in the form of a regular column which does not splash.

The body of the "jet-breaker" may be of any desired form and made of copper, bronze, aluminium or any other suitable metal or substance such as, glass, celluloid, composition, *etc.* but in all cases it will be made in two parts properly united together so as to allow of its easy cleaning.

In the accompanying drawing I have represented several models of my "jet-breaker," arranged the one in order to be brazed to the nose of the cock and the others to be removably connected to the cock by means of an india-rubber tube or ring.

Figs. 1 to 3 refer to the first model, Fig. 1 being a vertical section of the device, Fig. 2 a plan view, and Fig. 3 showing the "jet-breaker" adapted to a cock.

Figs. 4 and 5 represent sectional views of two other models.

Figs. 6 and 7 represent a modified construction of the "jet-breaker" and

Fig. 8 represents a fourth modified construction.

With reference to Figs. 1 to 3 it will be seen that the body of the device is made in two parts *a* and *b* which are screwed one upon the other, the upper part *a* terminating in a tube a^1 which is intended to surround the nozzle of the cock, whilst the lower part *b* or grating terminating in a more or less conical nozzle or adjutage b^1 is provided with a shoulder *c* upon which rest one or more perforated metal sheets or plates *d d* which are forced into the device.

In order to clean or remove the perforated metal sheets, it is only necessary to unscrew the lower part *b* of the device which is provided with an external milled band *f* for this purpose.

The water under pressure issuing from the cock fills the chamber *o* formed by uniting the two parts *a* and *b*, passes through the metal sheets *d* where it is filtered and where the jet is broken up, it then passes out in a regular column, and falls without causing any splashing.

In Fig. 4, similar letters refer to same parts. The device acts in precisely the same manner, but instead of being directly secured to the cock, it is connected thereto by means of an india-rubber tube *m*, the part *a* being curved outwardly to better secure the tube as shown.

The perforated sheets may be equally well cleaned or removed in this case also.

In Fig. 5 the grating *b* is also screwed upon the upper part *a*, but the perforated metal sheets are set in this grating. The said sheets may however be cleaned when desired as also the whole of the "jet-breaker."

Attachment for Cocks, &c., for Ensuring an Even Flow of the Liquid therefrom.

With reference to Figs. 6 and 7 it will be seen that the body *a* of the device is made of stamped or chased metal, formed with an interior shoulder for supporting the perforated metal discs *d*, and the second part *b* is formed by a cork or india-rubber ring adapted in the interior of the part *a* and extending up to its upper edge. This ring allows, on account of its elasticity, of its easy fixing to the nose of the cock, and ensures the tightness of the joint.

As it may be seen in Fig. 8, the second part *b* which is of india-rubber extends upwards beyond the upper edge of the part *a*, and enables the utilising of the elasticity of the india-rubber in order to adapt the device to the cocks of different diameters. In this case, in order to properly unite the parts *a* and *b*, a metallic ring *x* is placed in the lower part of the india-rubber tube, and it has a diameter large enough to ensure on the one side the adhesion of the tube and the ring and on the other side to compress the tube between said ring and the side of the part *a*. The ring *x* will be preferably split so as to act as a spring and facilitate the mounting of the device.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1.—A device termed "jet-breaker" which adapts itself to cocks or nozzles for the flow of the water or other liquids for the purpose of regulating the flow and more particularly for preventing the liquid from splashing,—this device comprising two parts which are united together, one of which is connected to the nose of the cock or nozzle and the other is provided on its inside with perforated metal sheets which the liquid jet is forced to traverse before flowing to the outside.

2.—A device according to Claim 1, of copper or other suitable metal made in two parts *a* and *b* screwed one upon the other, the part *b* having on its inside perforated metal sheets *d*, and the part *a* being brazed or soldered to the nose of the cock, substantially as hereinbefore described and illustrated by Figs. 1 to 3 of the accompanying drawing.

3.—A device according to Claim 1, with two parts *a* and *b* screwed one upon the other, the part *b* having on its inside perforated metal sheets *d* and the part *a* being curved outwardly so as to receive an india-rubber tube *m* which adapts itself on the other side to the nose of the cock, substantially as hereinbefore described and illustrated by Figs. 4 and 5 of the accompanying drawing.

4. A device according to Claim 1, with a part *a* upon an interior shoulder of which rest perforated metal sheets *d*, and a part *b* of india-rubber or cork which is forced in the inside of the part *a* so as to extend up to its upper edge and which adapts itself by mere elastic contact to the nose of the cock, substantially as hereinbefore described and illustrated by Figs. 6 and 7 of the accompanying drawing.

5.—A device according to Claim 1, with a part *a* upon an interior shoulder of which rest perforated metal sheets *d*, and a part *b* of india-rubber arranged in the inside of the part *a* and extending upwards beyond the edge of this part so as to adapt itself to the nose of a cock in the way of an ordinary india-rubber tube, in combination with a metallic split ring *x* placed in the inside of the part *b* and in its lower end in order to properly unite the parts *a* and *b* substantially as hereinbefore described and illustrated by Fig. 8 of the accompanying drawing.

Dated this 25th day of February 1899.

WHEATLEY & MACKENZIE,
10, Chancery Lane, London, W.C., Agents.

Redhill: Printed for Her Majesty's Stationery Office, by Malcomson & Co., Ltd.—1899.

2 App. 311

[Page 310 is on Card 20]

Defendant's Exhibit 45

PATENT SPECIFICATION

625,084

Application Date: June 22, 1938. *No. 18571/38*

Complete Specification Accepted: June 22, 1949.

Index at Acceptance:—**Classes 14(i), B2e; and 86, B8b.**

COMPLETE SPECIFICATION

Improvements in and relating to Devices for Mixing Air with Water

I, ELIE AGHNIDES, a Greek Subject, of 14, Boulevard de Waterloo, Brussels, Belgium, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In the specification of my Letters Patent No. 468,687 I have described a device for intimately mixing air with a liquid flowing under pressure, wherein an injector portion is provided, upstream of the part where it aspirates air, with a perforated cross partition that divides the stream of liquid into a number of small streams, and downstream of said part with an atomising and mixing part comprising one or more finely perforated plates. The object of the upstream perforated plate was to assist the dividing effect of the downstream perforated plate or plates, in order to obtain a fine division of the streams of fluids and a thorough mixing of both air and liquid particles.

The device according to the present invention for producing a jet of water containing air bubbles comprises an injector portion which is provided, upstream of the part where it aspirates air, with a perforated cross partition and downstream the said part with an atomising and mixing part comprising one or more finely perforated plates, the present device being characterised, however, in that the holes in the said plate or plates are so small and close together as to divide the air into particles of such size as to form small air bubbles having a tendency to remain in suspension in a jet of liquid, the holes in said plate or plates, or the number of these plates, or the outlet of the device being such as to force the liquid streamlets issuing from said holes to join together and to form at the outlet a single stream or jet. When both these conditions are fulfilled, one obtains, for instance with water and air, a single jet wherein the air bubbles are imprisoned in the water, which jet can be described as a "white" jet owing to the amount of air which is contained in the jet, this amount being appreciably greater than that contained in a jet produced by the device according to my said Patent Specification.

It has been proposed to mix a liquid with a gas by placing downstream the injector portion of the device superposed plates with big apertures in such a manner that the apertures of one plate always lie over the full portion of the next plate. In such an arrangement the resistance offered by the plates is too great and their dividing action is too small and uneven to produce a stream of the type produced by my invention. In a device of this type the amount of air entrained is small, its division insufficient, and the resulting stream feels substantially the same to the touch and appears substantially the same to the eye as an ordinary stream of water. In my device the resistance offered by the plate or plates is relatively very small, and its, or their, dividing capacity is accordingly even and great. As a result, a great volume of air is mixed with the water, the air is evenly and finely divided, and the bubbly stream produced is white and fluffy like foam and has properties never seen before.

The first condition can be met by using one or several sieves or perforated members having holes each of about 0.6 of a millimetre square, this size being however not critical.

The second condition can be met by using a sieve or perforated member as indicated wherein the holes are so near that the streamlets of water passing therethrough immediately join together. One can also use more than one such sieve, for example, several sieves, superposed or distanced from each other, whose holes are somewhat larger, combined with at least one sieve with very close holes as aforesaid. Finally one can also use one or more sieves, such as indicated or with larger distance between the holes, but arranged upstream of a constriction in the casing of the device, so as to force the streamlets to join together and thereby to form a single, not divided jet at the outlet.

Devices for atomizing and aerating liquids are known, which comprise an injector

5 App. 312

Defendant's Exhibit 45

portion and, downstream this injector portion, a dividing and mixing part but, in these devices, the atomizing and the aeration are mainly effected by the rotation of a plain spherical valve or body, upon which the jet of liquid under pressure impinges for putting this body in motion. These devices are somewhat complicated and costly and their application is rather limited, for instance they cannot be mounted on an ordinary water tap or faucet, and the water jet impinging on the spherical body must have a substantial pressure in order to withdraw the spherical body from its seat and put it in rotation. Further, the quantity of air passing through is rather small.

My invention can readily be understood by reference to the accompanying drawing, in which Fig. 1 is a sectional view of a device embodying my invention which is shown as attached to an ordinary water faucet through the medium of a connecting device such as is described in my Patent No. 451,142; Fig. 2 is a sectional view of a device adapted to be screwed onto an ordinary water pipe; Fig. 3 is a section on line III-III of Fig. 2; Fig. 4 is a sectional view showing a further modified form; Fig. 5 is an additional sectional view of a further modification. Fig. 6 is a sectional view of a device adapted to be connected with a flexible hose or metal tube. Fig. 7 is a section on line VII-VII of Fig. 6.

Referring now to Fig. 1, 1 designates an ordinary faucet or tap. 2 is a tap connector, the operation of which is described in detail in my patent 451,142. 4 is the casing of the mixing device enclosing the primary mixing chamber. The perforated screen 6 admits the water into the casing 4 in the form of a plurality of jets. A plurality of air ports 8 are provided for admission of air into the interior of the casing 4. 10 is a screen at the lower part of the casing, and below the screen 10 the casing narrows to form a constricted passage 12.

The screen 10 is here made of a sieve having very narrow holes for instance capillary holes or holes of about 0.6 square millimetres, these holes being so near as to force the streamlets passing therethrough to join immediately together. However, when using the constriction 12, these holes need not to be so near, such a constriction performing the joining together of the small streamlets.

When the water is turned on through this device, if the faucet is only opened slightly so that very little kinetic energy is developed in the water as it emerges from the perforations in screen 6, the water will come out of the discharge 12 in a perfectly normal manner. However, as the water pressure is increased and the velocity increases, the water emerging from the perforations of screen 6 will draw air into the chamber through the por· 8 and this water striking the screen 10 at comparatively high velocity this water and the air will be broken up and finely divided. This water will pass through the screen with the air and emerge from the outlet 12. As the diameter of outlet 12 is substantially greater than the aggregate diameter of the perforations in screen 6, the water will have relatively low velocity as it comes out from the discharge.

In the form of device shown in Fig. 2, a metal casing 14 is screwed directly onto the faucet 1. This casing holds the screen 16 against the mouth of the faucet and the casing is provided with three sieves 18. A series of ports 20 are provided in the casing to admit air in a manner similar to that already described in connection with Fig. 1.

In this form, the screen 16 has only a central aperture, and at least one of the sieves 18 must have very narrow holes, as described in reference to Figure 1. If no constriction is provided at the outlet of the casing 14, the holes of the lower sieve must be as near as possible. The sieves 18 are here shown as distanced apart, but it is to be noted that they can be superposed, and that the number of these sieves is not restrictive.

In Fig. 4 the casing 3 is provided with a union coupling 5 for connection to an ordinary hose. The screen 7 is clamped between the casing 3 and the mouth of the faucet. Air is admitted to the interior of the casing by a series of horizontal perforations 9. In this case two screens are provided at the outlet as indicated at 11 and 13.

In Fig. 5 the plate 15 has a plurality of holes near the periphery and the casing 17 is formed with inwardly extending projections or baffles as indicated at 19. The principal part of the water coming through the openings in the plate 15 will strike these projections and be broken up.

Air is sucked through openings 21 and is forced, with the water through both sieves 19 mounted above a constricted part 22 at the outlet of the casing 17.

In Fig. 6 and 7, a perforated plate, 23, comprising a central opening or peripheral holes as in Fig. 5, or uniformly distributed holes as in Fig. 1, is mounted in a recess of a rubber connector 24, the cylindrical outside of which is provided with longitudinal recesses 25 for the admission of air. The casing proper 26 is engaged on this connector, and comprises one or more sieves 27 as indicated above, with or without a constriction such as 28 at the outlet. In the center of the connector 24, is rigidly mounted a tubular member 29, for the reception of a flexible or non-flexible hose or pipe 30 to be connected with any source of water under pressure.

paratus 35, communicating with the same ozonizer 36. If now one of the faucets is opened, the liquid discharged thereby draws in ozone from the said apparatus through the duct 37, and the apparatus is automatically thrown into action by the aforesaid switch. In order to avoid in this case the admission of air to the spouts from spouts which are not in operation, so that nothing but ozone is drawn in by the liquid, each spout is preferably provided with a back pressure valve.

In the example illustrated in the drawings, the transformer and the ozonizer are inclosed within the same casing.

Claims:

1. In a system for treating liquids with ozone, the combination with a duct for the liquid, means to add ozone to the liquid while passing through said duct, a plurality of cup shaped plates located within said duct so as to bar the free passage of the liquid and having apertures adapted to break the liquid up into fine streams.

2. In a system for treating liquids with ozone, the combination with a duct for the liquid, means to add ozone to the liquid while passing through said duct, a plurality of plates located within said duct so as to bar the free passage of the liquid and having apertures adapted to break the liquid up into fine streams, said plates being formed with upwardly extending flanges having teeth engaging in notches made in the surfaces of the adjacent plates.

3. In a system for treating liquids with ozone, the combination with the mixing chamber, of an electric ozonizer, means to throw said apparatus into operation, said means being located on the ozonizer and away from the mixing chamber, and a connection between said mixing chamber and ozonizer whereby said means for throwing the ozonizer into operation are controlled by the passage of the liquid through said mixing chamber.

4. In a system for treating liquids with ozone, the combination with a mixing chamber comprising a liquid supply, and means to draw in the ozone by suction, of an ozonizer, controlling means for the same, a suction duct connecting said ozonizer and said mixing chamber, means operated by the pressure within said suction duct to actuate said controlling means for the ozonizer.

5. In a system for treating liquids with ozone, the combination with a mixing chamber comprising a liquid supply, and means to draw in the ozone by suction, of an ozonizer, controlling means for the same, a suction duct connecting said ozonizer and said mixing chamber, means operated by the pressure within said suction duct to actuate said controlling means for the ozonizer, and a valve within said duct adapted to prevent the liquid from flowing from the mixing chamber to the ozonizer.

6. In a system for treating liquids with ozone, the combination with an ozonizer and a plurality of mixing apparatus for adding the ozone to the liquid, of connections between each of said mixing apparatus and the ozonizer, and automatic means controlled by each of said mixing apparatus to throw the ozonizer into operation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MAX FUSS.

Witnesses:

JEAN GRUND,

CARL GRUND.

Note

Page 310 is on
Card 20

Note

Page 306 is blank

Z App. 313

Defendant's Exhibit 45

It is to be noted that in all the forms shown, the number of sieves, their form, and also the form of the perforated plate upstream of the casing's chamber, are not limited to those shown, and these may be removed for cleaning.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

A device for producing a jet of water containing air bubbles, comprising an injector portion which is provided, upstream of the part where it aspirates air, with a perforated cross partition and downstream the said part with an atomising and mixing part comprising one or more finely perforated plates, characterised in that the holes in said plate or plates are so small and close together as to divide the air into particles of such size as to form small air bubbles having a tendency to remain in suspension in the jet of liquid, the holes in said plate or plates, or the number of these plates or the outlet of the device being such as to force the liquid streamlets issuing from said holes to join together and to form at the outlet a single stream or jet.

Dated this 22nd day of June, 1938.

BROMHEAD & CO.,
Chartered Patent Agents,
229-230, Strand, London, W.C.2.

Printed for His Majesty's Stationery Office by Dean & Co. (Stockport) Ltd., Stockport and London. 39-221-0-1939
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. 0d. each (inland), 2s. 1d. (abroad), may be obtained.

Defendant's Exhibit 45

[Page 314 is blank]

625,084 COMPLETE SPECIFICATION 1 SHEET

Fig. 1

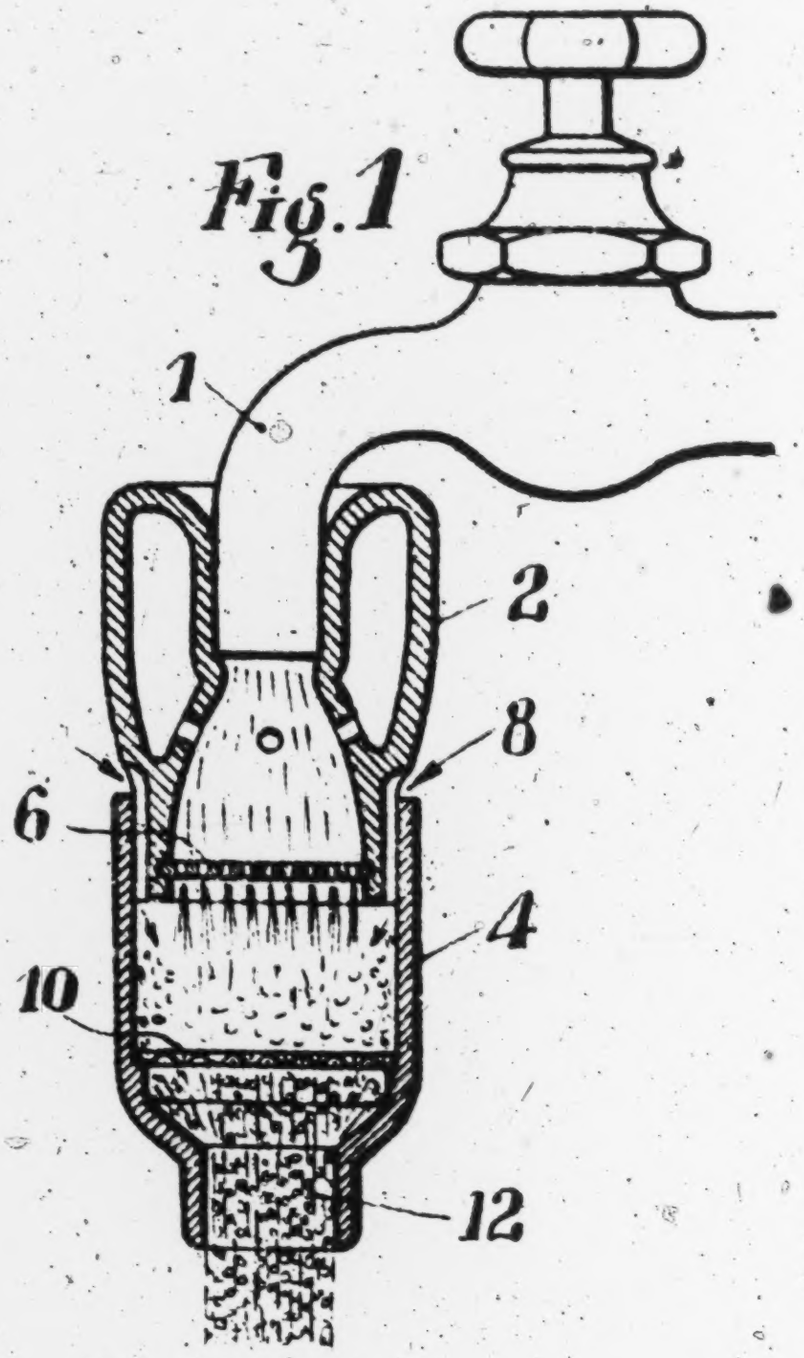
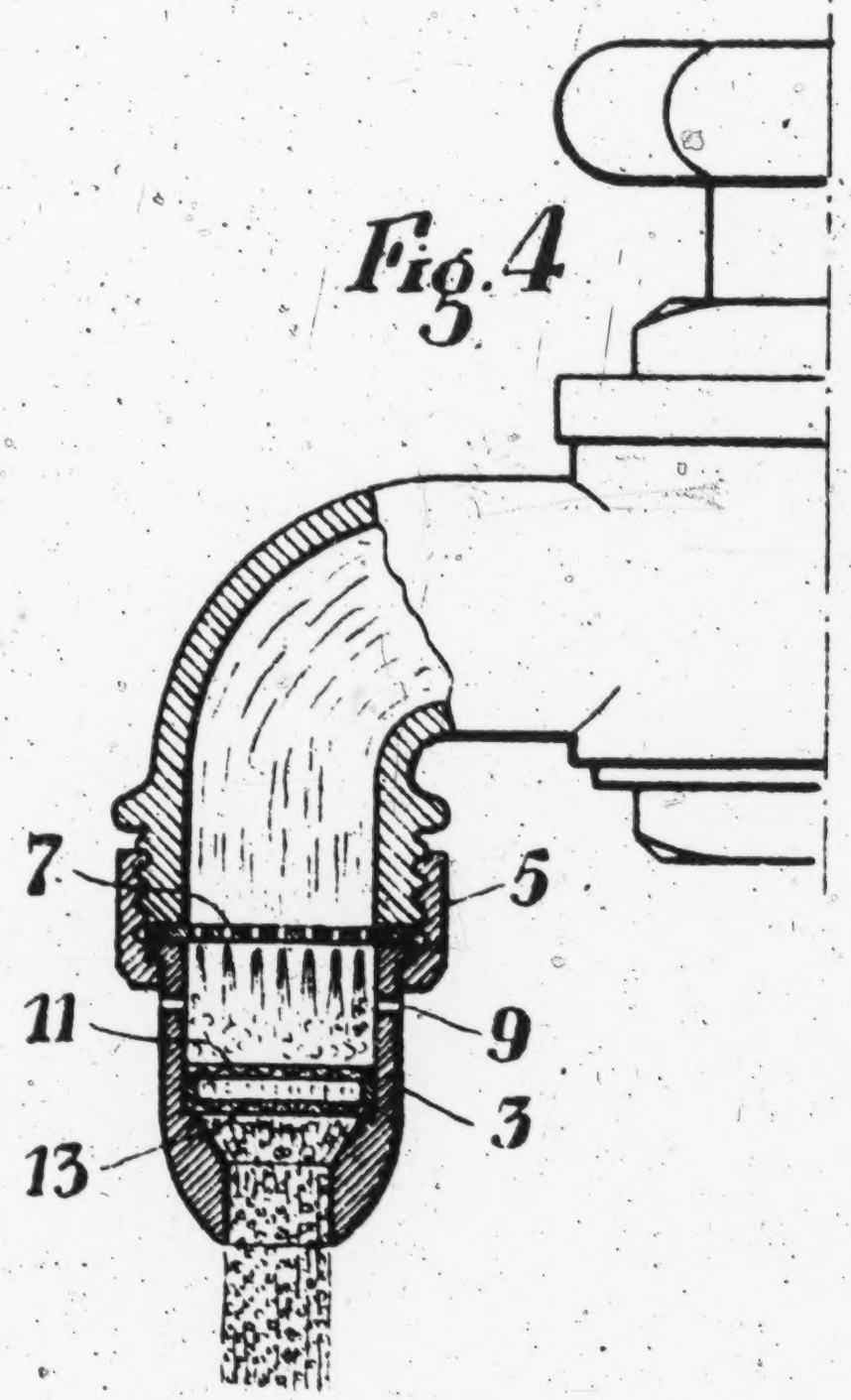
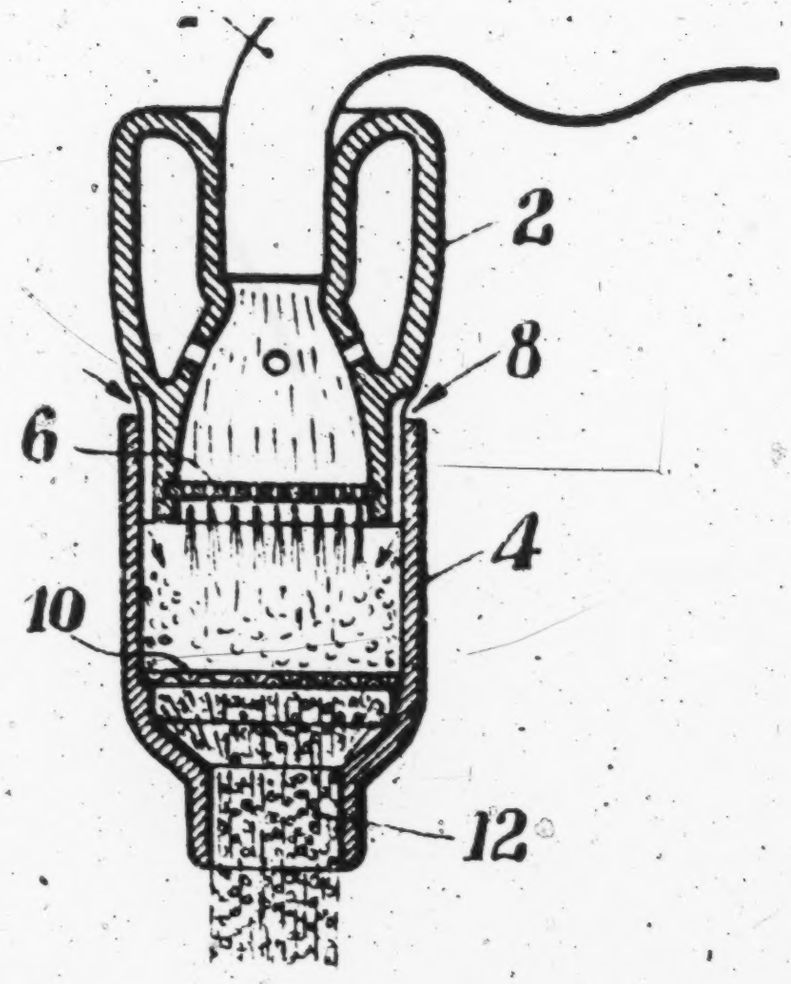


Fig. 4



Original on a reduced scale.]

[This Drawing is a reproduction of the Original on a reduced scale.]



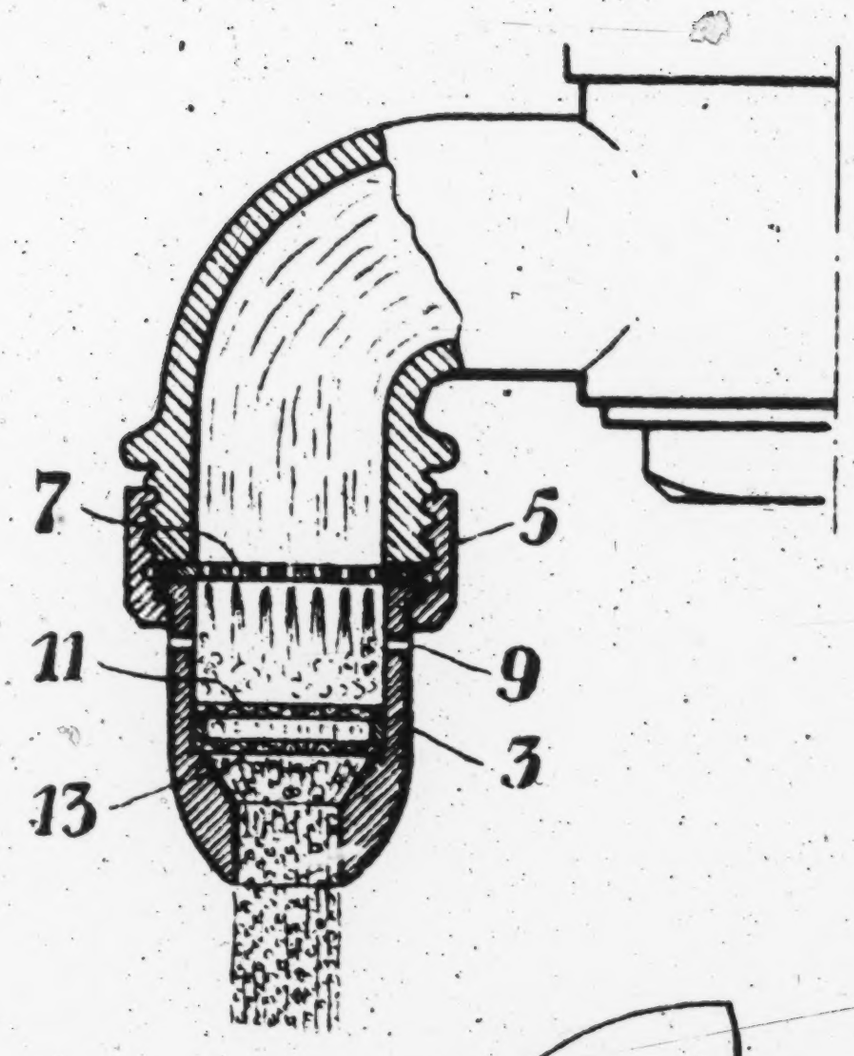


Fig.2

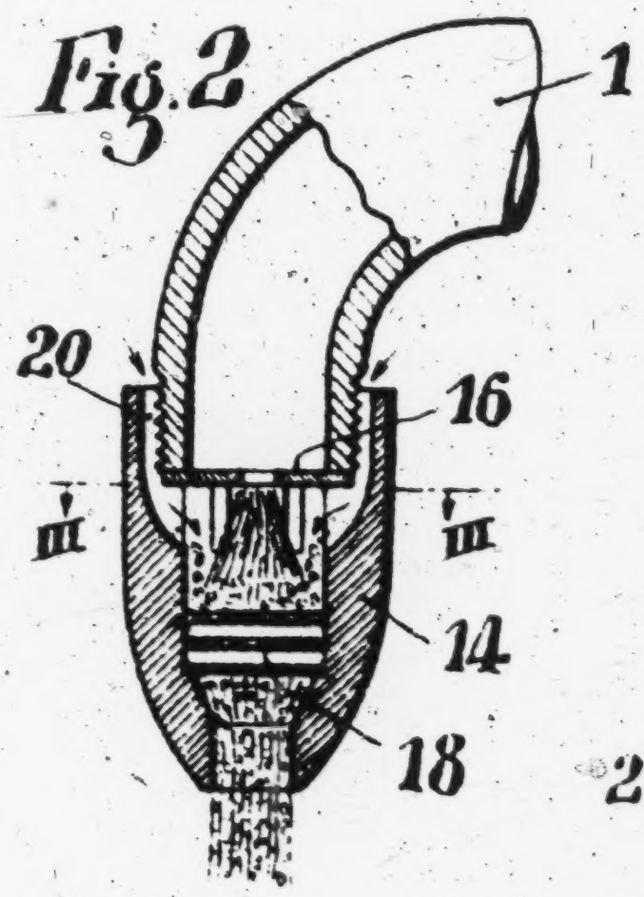


Fig.5

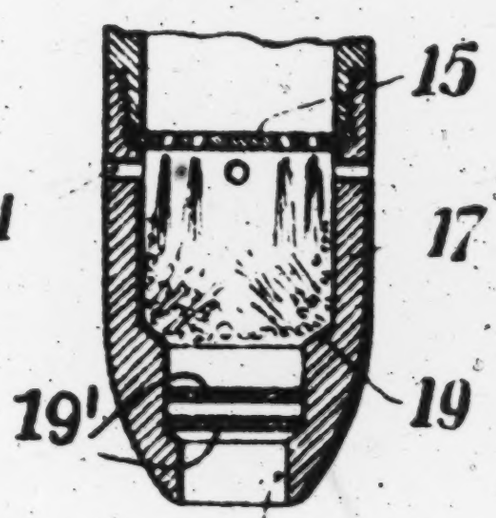


Fig.6

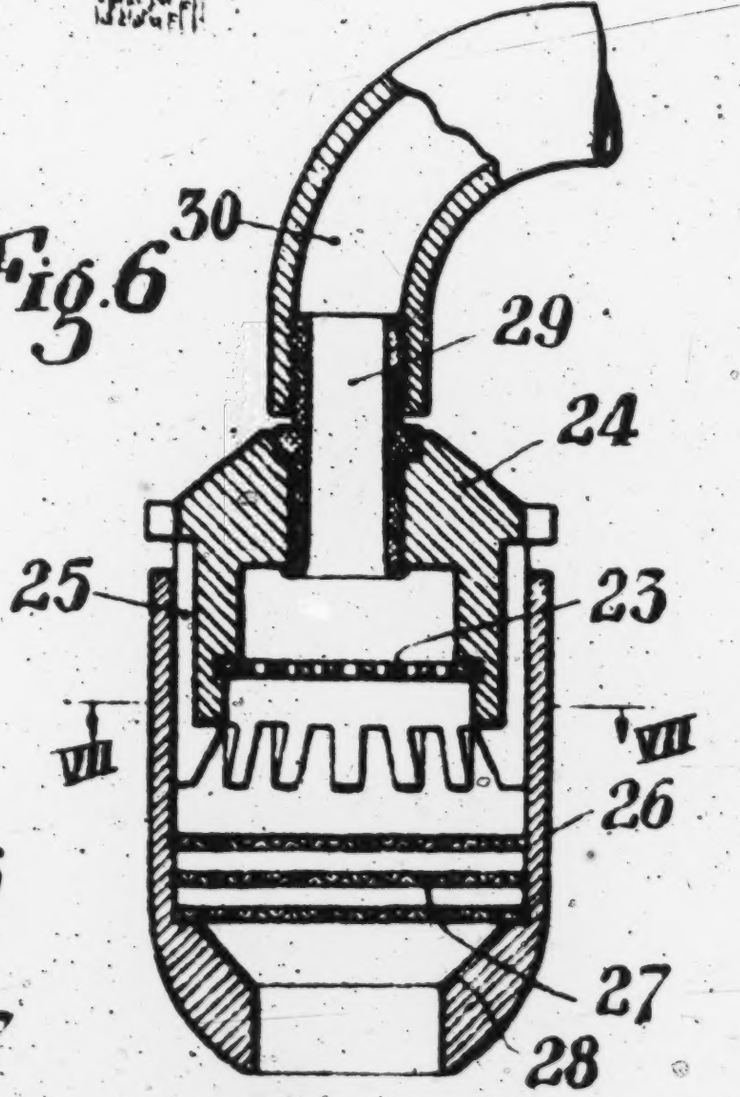


Fig.3

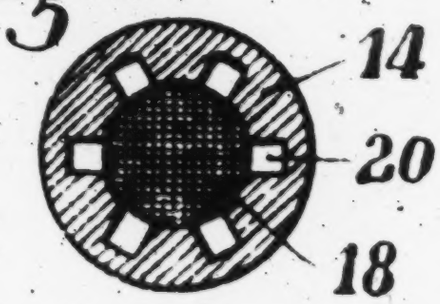
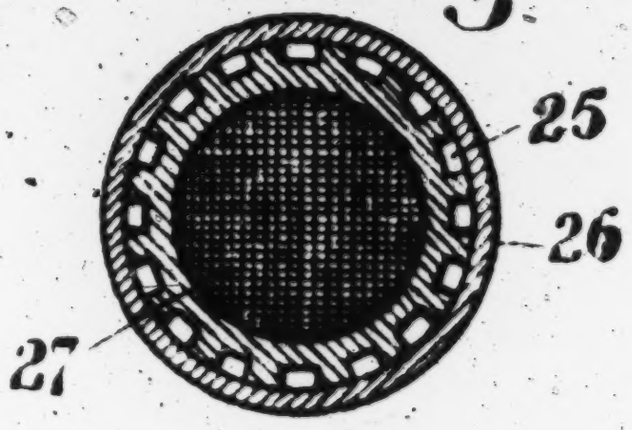


Fig.7



☆☆☆☆☆☆☆☆☆☆☆☆

☆☆☆☆☆☆☆☆☆☆☆☆

AUTHENTICATING CERTIFICATE BY COUNCIL OF THE UNITED STATES OF AMERICA IN OTTAWA, ONTARIO, CANADA.

Seal **Signature**

☆☆☆☆☆☆☆☆☆☆☆☆

☆☆☆☆☆☆☆☆☆☆☆☆

CERTIFICATION BY COMMISSIONER OF PATENTS OF CANADA PATENT OFFICE CERTIFYING THE ATTACHED COPY OF FILE WRAPPER OF AGLMIDES PATENT.

Seal **Signature.**

☆☆☆☆☆☆☆☆☆☆☆☆

☆☆☆☆☆☆☆☆☆☆☆☆

2 App. 378 Canadian File Wrapper

DUPLICATE

CANADA

No. A430681

Department of the Secretary of State — Patent and Copyright Office

Département du Secrétaire D'État — Bureau des brevets et droits d'auteur

Received from
Reçu de

Elie Aghnides

Dec. 9, 1958

the sum of
la somme de

Twenty-five dollars

$ 25.00

in payment of the fee on
en paiement des droits relatifs à

final

1062

D. J. Shuttleworth

Accountant
Comptable

Note

Pages 322-326 are on Card 23;
Pages 327-336 are on Card 24;
Pages 337-346 are on Card 25;
Pages 347-359 are on Card 26;
Pages 360-372 are on Card 27;
Pages 373-377 are on Card 28;
Pages 378 is in the next frame;
Pages 379-380 are on Card 28.

2 App 381
490,112

Canadian Patent

CANADA
THE PATENT OFFICE

PATENT No. 490,112 ISSUED FEB. 3, 1953

Fluid Mixing Device

Elie Aghnides, Brussels, Belgium

Application November 15, 1939, Serial No. 468,776
5 Claims

1

This invention relates to apparatus for the intimate mixture of the ambient air with water flowing under pressure, and consisting of an upper part forming ejector for the intake of the air by the water under pressure, and an outlet, and comprising between this outlet and the ejector a dividing mixer through which the two fluids water and air are forced to pass. According to the purpose of this invention, such apparatus are essentially meant to be fitted at the outlet of a tap for the distribution of the town's water supply.

In certain known contrivances of this type, the dividing mixer is made up of projections, baffles, stops, or other radial devices, or otherwise disposed, on which the jets of both fluids come to be broken up so as to determine a more or less intimate intermixture of both fluids. In these devices, the jet leaving the apparatus has no cohesion, it is exactly like an ordinary water jet in appearance, the air which is carried escaping immediately at the outlet.

In other known apparatus, the dividing mixer consists of a plate with relatively large perforations, which give the same result as that obtained by means of projections or of baffles.

Further, a device of this type is known in which the divider is formed by at least one plate with extremely fine holes, of a capillary character, these holes which are very tiny, determine according to the characteristic features of this apparatus, a real atomisation or pulverization of the air, which is thus divided in such tiny particles that they momentarily escape to the law of gravitation, and they furnish a water jet of grey appearance, which is flat, not frothy, containing a very weak proportion of air which remains in suspension in this water during a more or less long period of time.

In a general manner, the known devices meant to "aerate" the water, fail in their object, because they supply a jet in which the air, carried along in the shape of big bubbles, escapes immediately at the outlet of the apparatus, or else the air is so finely divided up in them in such very minute particles that the percentage of air carried along is extremely small and gives to the jet an appearance which is disagreeable and not appetising.

I have found that it is possible, by simple and cheap means which are not cumbersome, to obtain a jet with a big proportion of air (up to 30-60% of the total volume), in which the air remains in suspension in the shape of fine bubbles which impart a total volume), in which the air remains in suspensnow-white colour to it, this jet, which is soft to the touch, being essentially frothy, very light, non-splashing, quite cylindrical and regular. Such a jet

2

with a soap solution gives an abundant froth, which is compact and resistant, never obtained up till to-day; poured into a glass, this jet fills the glass, then in a few minutes, through the escape of the air which it contained, only occupies 40-70% of the initial volume, which proves the enormous quantity of air carried in the jet.

As stated, the apparatus, according to the invention consists of an upper part forming injector, and below this, a dividing mixer. The latter consists of one or more perforated devices or of screens superposed or else disposed step-wise, and according to the invention, this dividing mixer must, to give the new result, that is to say a jet which is stable, frothy and of snow-white colour—result which until now had never been sought for—answer at one and the same time to the three following fundamental conditions:

a—the passages across the dividing mixer, at the place where the section is smallest, must correspond to a circular section of a diameter included between 0·05 and 2·5 mm.

b—the total height of the said passage, without taking into account the eventual intervals between the elements disposed step-wise, must not exceed 30 times the value of the diameter of the circular section to which the section of the passages corresponds.

c—the passages must be so close together that the suction zone of each jet coming out of any passage whatever cuts the suction zone of the neighbouring jets, or must at least be at a tangent with it.

As a non-limitative example, a contrivance giving good result has been obtained by using 3 No. 40 screens (40 wires of 0·23 mm. section per inch) with an interspace of 1 mm. between each other, placed at 5-10. mm. beneath a perforated plate having 32 holes of 8/10 of a mm. in diameter and on an exit vent or outlet restricted to a 17 mm. diameter.

The first of the conditions aims at obtaining a division of the air such that sufficiently small bubbles are obtained in the jet, that is to say having the tendency of remaining in a suspended state in the jet; below these dimensions one falls into apparatus for atomising the air, and above, one obtains bubbles which are too big, which burst immediately and escape from the jet at the outlet of the apparatus. These passage dimensions, can evidently be obtained by means of the superposition of screens with larger holes, where the holes do not exactly coincide over the entire height of the passages.

The second condition aims at obtaining a full

Note
Page 314 is blank

Note

Page 316 is blank;
Page 317 is on Card 20;
Page 318 is blank;
Page 319 is on Card 23.
Page 320 is blank;
Page 321 is to the right of this note
Pages 322-326 are on Card 23;
Pages 327-336 are on Card 24;
Pages 337-346 are on Card 25;
Pages 347-359 are on Card 26;
Pages 360-372 are on Card 27;
Pages 373-377 are on Card 28;
Page 378 is in the next frame;
Pages 379-380 are on Card 28

2 App.382
Canadian Patent
190.112

jet, with a large proportion of air The greater the height of the dividing device the greater is the resistance which it offers to the passage of the two fluids. beyond a certain resistance, the quantity of air carried away decreases, and the apparatus loses some of its interest

The third condition aims at obtaining a coherent well and plain jet, in which the air bubbles are imprisoned in the jet it equally aims at decreasing the resistance offered by the mixing means

These three essential conditions can give birth to quite a series of interesting embodiments, either applied to themselves or in combination with other constructive characteristics as will be brought out in the following description made with reference to the annexed drawings, in which

Fig 1 is an axial section of a first embodiment

Fig 2 is the same section of a variant

Fig 3 is a section according to III-III of Fig 2.

Fig 4 is a section of another variant

Fig 5 is a section of still another variant

Fig 6 is a section of a variant to be connected with a flexible connector

Fig 7 is a section according to VII-VII of Fig 6

Referring to Fig 1, 1 designates an ordinary household tap, and 2 is a connection for the tap, this connection is of known construction, 4 is the body of the mixing-divider. The perforated plate 6 allows the water to pass into the chamber 4 in the form of a large number of little jets, a series of passages 8 are provided for the admission of the external air into the chamber 4, through the action of the jets coming out of 6 10 designates a screen or sieve at the lower part of the body 4, above a narrowed outlet 12 The screen 10 consists of a sieve with passages, the section of which corresponds with tha tof a circle the diameter of which is included between 0 05 mm. and 2 5 mm and which answers to the three essential conditions previously indicated The contraction 12 at the outlet also offers a great interest from the point of view of the regularity of the jet which is escaping, and of the beauty of this jet

In the example shown in Fig 2, a metallic envelope 14 is screwed directly onto the tap 1 This envelope sustains the perforated plate 16 against the outlet of the tap, and it contains a divider consisting of three sieves 18 disposed step-wise or directly superposed A series of passages 20 is provided for the admission of the air

In this example the plate 16 is only provided with a single central hole The envelope 14 also has a contracted outlet

In Fig 4, the envelope 3 is equipped with a connector 5 meant to connect it with an ordinary tap The perforated plate 7 is fastened between the envelope 3 and the outlet of the tap, the air is admitted through perforations 9 The divider consists of two sieves 11 and 13

In Figure 5, the perforated plate 15 carries a series of holes towards the periphery, and the envelope 17 is provided with internal projections 19 The main part of the water passing through 15 strikes these projections and is broken up, and is already mixed with the air sucked in by the openings 21 Here, the divider consists of two sieves lodged in a contracted part 22 of the envelope 17

In Figs 6 and 7 a perforated plate 23 provided with a single central hole or with peripheric holes, or with holes uniformly distributed, is fitted in a notch in a rubber connector 24, of which the external cylindrical face is provided with longitudinal grooves 25 for the admission of the air. The envelope 26 is clamped on this connector and has three spaced sieves 27, and a contracted outlet 28. In the centre of the connector 24 a rigid tube 29 is rigidly fitted, so as to receive a flexible tube 30 which is to be connected with a source of water under pressure

Having now fully described my invention, what I claim and desire to secure by letters patent is

1 A device for producing a coherent jet of water containing air bubbles, comprising a chamber the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water, after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet

2 A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet

3 A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and

5

the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

4. The device of claim 1 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet

5. The device of claim 1 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently close together so that the

6

streams of aerated water issuing therefrom immediately join each other to form a single jet

MARION & MARION,
Box 368, Station "H",
Montreal, Que.,
Patent Agent.
of the Applicant.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P., Queen's Printer and Controller of Stationery, Ottawa, 1953

Note

Pages 384 and 386 are blank;

Pages 385,387,388, and 389 are on Card 28.

(155):

ENGLISH TRANSLATION OF AGHNIDES' DUTCH PATENT NO. 65,293

(156):

Published March 15, 1950.
(i.e. issued in published form)
Dated February 16, 1950.
(i.e. date of grant)

Patent Office of
the Netherlands

PATENT No. 65,293
Class 12 c 4 c (101 cs 4).

ELIE AGHNIDES, of Brussels.

SPOUT-ATTACHMENT

Application No. 93,976, filed June 22nd, 1939, at 14:45 o'clock, laid out or made public on October 15, 1949,—priority of June 22, 1938 for claim 1 (Great Britain).

The invention relates to a spout-attachment in one part which forms an injector and diaphragm, after which diaphragm air inlet openings are provided and with a single or plural dividing mixing body between this outlet opening and the air inlet openings.

A spout-attachment of this type is known from the French patent No. 800,069, in which according to this publication, air is distributed very finely in the water jet so that an emulsion results and the jet does not froth or foam.

In accordance with the invention, in this distributing and mixing body passage channels are present for the mixture of water and air which have a diameter of about 0.05 to 2.5 mm. and a total maximum length of about 30 times this diameter, as well as a mutual spacing which in-

sures an immediate combination of the separate jets issuing from the distributing and mixing body, and insures the inclusion of the air taken along, and has for a given dis-
(157):
tributing and mixing body a relation between the distance from the diaphragm to the distributing and mixing body and the required diameter of the distributing and mixing body: a value which is less than 1.4.

In this embodiment of the spout-attachment, the issuing jet does include a great quantity of air, in the form of bubbles, which prevents that the jet of foam becomes snow-white as soon as the jet is collected in a vessel. The jet may comprise 30 to 40 per cent by volume of air.

The distributing member meeting the above requirements may be attached in very varying ways, which are made clear in the following on the basis of the drawings. In the drawings:

Figs. 1 and 2 show axial sections of two different embodiments of the spout attachment.

Fig. 3 is a cross-section according to the line III—III of Fig. 2.

Fig. 4 an axial section of a third form of embodiment.

Fig. 5 an axial section of a distributing body according to an indicated embodiment.

Fig. 6 a longitudinal section of a spout-attachment, which is adapted to be attached to a flexible hose.
(158):

Fig. 7 a cross-section according to line VII—VII of Fig. 6, and

Figs. 8 and 9 axial sections of two other embodiments.

In Fig. 1 an ordinary house-tap 1 is shown, which is provided with a connecting-piece 2, to which the spout-attachment 4 is fastened. The water flows through the perforated plate 6 in the spout-attachment 4 in the form of a great number of small jets. On the circumference of this con-

necting-piece 2 are provided a row of channels 8, through which air from the outside may enter the spout-attachment under the effect of the water-jets coming from the apertures 6. In the lower part of the spout-attachment 4 is provided above a restricted outlet aperture 12 a sieve-plate 10. The meshes of this sieve-plate 10 are disposed within the confines of a circle, of which the diameter lies between 0.05 and 2.5 mm. The restriction 12 of the outlet opening compels the outflow in a regular stream.

In the embodiment according to Figs. 2 and 3, there is secured on the tap 1 a metal sleeve 14 which holds tight the perforated diaphragm 16 against the outlet-opening of the tap and which includes a distributing body which (159):

consists of three sieve-plates 18 at some distance or immediately above one another. The diaphragm 16 has in this embodiment only one central opening and the sleeve 14 has here likewise a restricted outflow.

In the embodiment according to Fig. 4, the sleeve is provided with a connecting-piece 5, with the aid of which it may be fastened to an ordinary water tap. The perforated diaphragm 7 is held tight between the sleeve 3 and the lower end of the tap, and the air enters through a row of apertures 9. The distributing body consists here of two sieve-plates 11, 13 disposed above one another.

The embodiment according to Fig. 5 has a perforated diaphragm 16, of which the openings are disposed on the circumference. The sleeve 17 is in this embodiment provided with inward projections 19. The main part of the water streams issuing from the openings in the diaphragm strike against the projection 19 so as to break off and are already mixed with the air drawn through the apertures 21, before the water reaches the distributing body. The distributing body is here formed by two sieve-plated disposed in the restricted part 22 of the sleeve 17.

In the embodiment according to Figs. 6 and 7, the diaphragm 23, which may have one single central opening or (160):
openings uniformly distributed therearound, is positioned in a groove of a rubber connecting-piece 24, in which the cylindrical outer plane is provided with longitudinal grooves 25 for the admission of air. The sleeve 26 is pressed on this connecting-piece 24 and comprises three sieve-plates 27 disposed at a distance and has a restricted outlet-opening 28. In the center of the connecting-piece 24 a tube-part 29 is immovably fixed, whereupon a flexible hose 30 may be attached which is connected with a source of water under pressure.

In the embodiment according to Fig. 8, the spout-attachment 31 is provided on the rim 32 with lateral apertures for the admission of air. The spout-attachment is screwed to a metal connecting-piece 33, which in its turn is screwed on the end of a jet 34. The perforated diaphragm 35 is held tight between the connecting-piece 33 and the spout-attachment 32. The distributing body consists of three sieve-plates 39, which are separated from one another by rings 40. In this embodiment, the channel of the connecting-piece 33 has a restriction above the diaphragm 35, which has as its object the concentrating of the stream of water in the axis of the channel with a view after passing it from the diaphragm 35 to attaining a greater velocity in the mid- (161):
dle, so that the distribution of the air drawn along over the entire cross-section of the jet before reaching of the distributing body 39 is made more uniform.

The embodiment according to Fig. 9 has likewise a restriction 37 and below this restriction an extra perforated plate 36, which is disposed above the diaphragm 35. The plate 36 has in view, with respect to the effect of the restriction 37 to distribute the water better over the spout-attach-

ment 31. The extra plate 36 may also be applied to the embodiments according to Figs. 1 and 4, for instance, without the presence of the restriction 37. In the embodiment according to Fig. 9, the distributing body consists of three sieve-plates 41 disposed above one another, which are contained in a ring 42.

CLAIMS:

1. Spout-attachment in one part which forms an injector and through which water may flow through a perforated diaphragm, after which diaphragm air inlet openings are provided and with an outlet opening and a single or plural-divided mixing body between this outlet opening and the air inlet openings, characterized in this, that in the distributing and mixing body (10, 11 and 13, 18, 27, 39, 41) passage (162):
channels are present for the mixture of water and air, which have a diameter of about 0.05 to 2.5 mm. and a total maximum length of about 30 times this diameter, as well as a mutual spacing, which insures an immediate combination of the separate streams coming from the distributing and mixing body and insures the inclusion of the air taken along, and that for a given distributing and mixing body the relation between the distance from the diaphragm (6, 7, 15, 16, 23, 35, 36) to the distributing and mixing body and the required diameter of the distributing and mixing body has a value which is less than 1.4.

2. Spout-attachment according to claim 1, characterized in this, that upstream from the diaphragm (23 or 35) a perforated body (36) and/or a restricted passage opening (29 or 37) is provided.

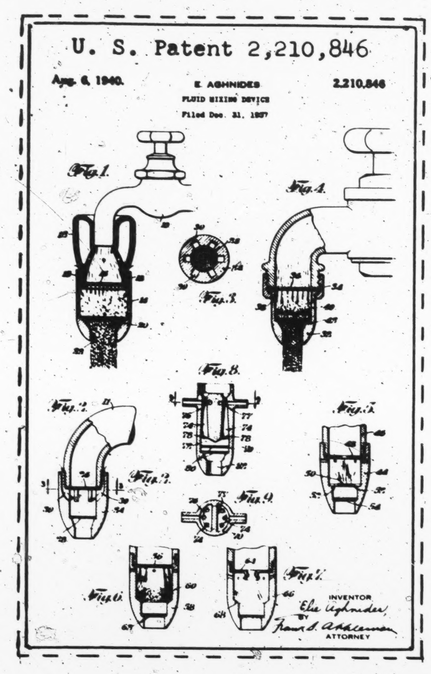
In the United States
Aghnides has sworn that these patents
within the red enclosure are the same invention.

In Canada
Aghnides has sworn that these patents
within the green enclosure are the same invention.

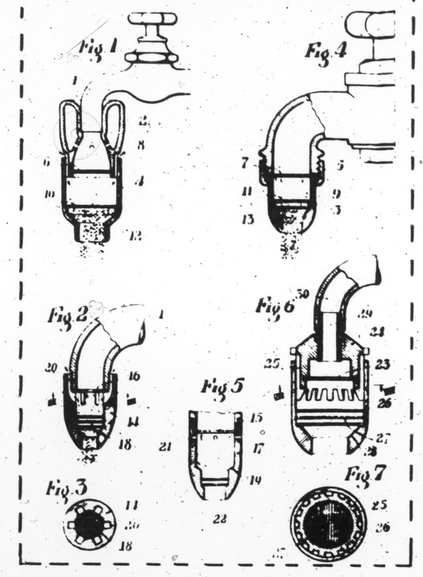
(RED)

(GREEN)

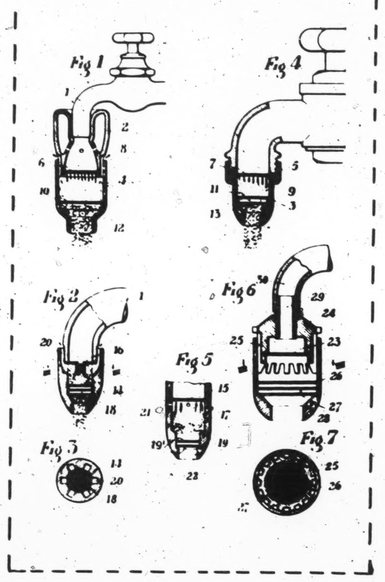
U. S. Patent 2,210,846



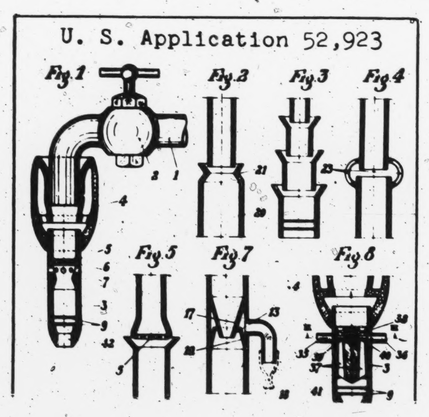
Figures 1-7 of
Dutch Patent 65,293



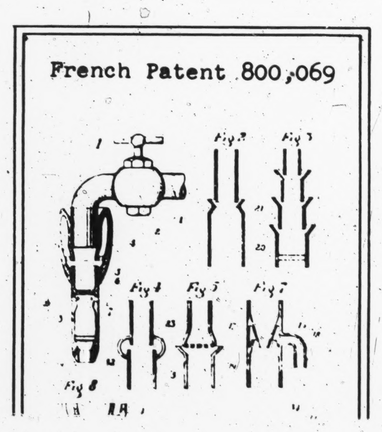
British Patent 625,084



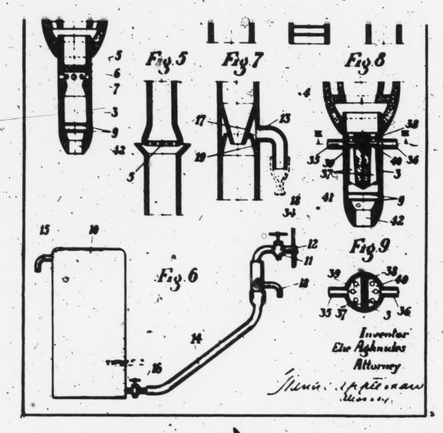
U. S. Application 52,923

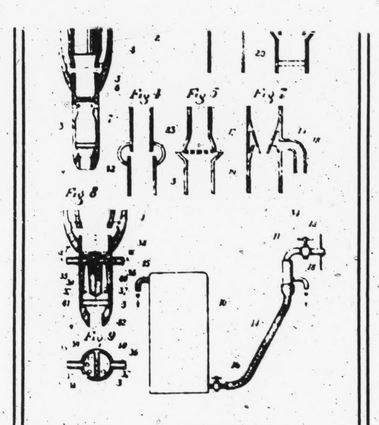


French Patent 800,069



"CHART No. 2"





The drawings of

U. S. Application 52,923	and	French 800,069

are identical.

1. In Canada
Aghnides has sworn that

U. S. 2,210,846

is the same invention as both

Dutch 65,293	and	British 625,084

2. In the Netherlands
Aghnides has sworn that

Dutch 65,293

is a different invention from

French 800,069

2 App. 322 Canadian File Wrapper

Application No. 408,776 Filed NOV. 15 1952

Class 209

Sub-Class 1

Title Fluid Pumping Device

Index Title

Inventor E. ARMIES

Referred to Division 7 193

Examiner Reports and Amendments

A

OCT 27 1950 B

MAY 30 1952 C

Stop Order { Entered / Removed

Publish { Claims 1 2 3 4 / Figure Figs. 1 & 4

Notice of Allowance

Dated DEC 2 1952

Allowed NOV 27 1952 193

Examiner.

(OVER)

MA ON & MARION
NEYS AND EXPERTS
NIVERSITY STREET
ONTREAL, CANADA

Form ... COPYRIGHT OFFICE
NOV 16 1939
PATENT ACCOUNTANT

Application for Canadian Patent

PETITION WITH POWER OF ATTORNEY
AND
APPOINTMENT OF CANADIAN REPRESENTATIVE

Patent Act 1935

TO THE COMMISSIONER OF PATENTS,
OTTAWA,

THE PETITION OF Elie AGHNIDES, a citizen of the Greek Republic and resident of Brussels, Belgium, 14, Boulevard de Waterloo,

showeth:—

THAT your petitioner made the invention entitled Device for intimately mixing ~~air with water flowing under pressure~~ Fluid mixing Device

which is described and defined in the attached specification.

THAT your petitioner verily believes that the said invention was not known or used by others before it was invented by him (him or them) and will neither have been in public use or on sale in Canada, nor have been described in any patent or in any publication printed in Canada or in any other country more than two years prior to the presentation or filing of this petition. {Your petitioner requests that this application be treated as entitled to priority as follows having regard to the following applications for patents heretofore made in other countries, namely: Holland, June 22nd 1939 - Sweden, June 26th 1939.} (Ld. 28/10/52)

Specify the applications relied upon and indicate to which of the claims now made they respectively relate.

THAT your petitioner hereby appoints Raymond A. Robic of 1255 University Street, Montreal, Canada, to represent him (him or them) and stand in his (his their) place and stead for all purposes of the Patent Act 1935, including the service of any proceedings taken under any provision of the said Act.

THAT your petitioner appoints Messrs. Marion & Marion, of 1255 University Street, P.O. Box 390 (Station "B"), Montreal, Canada, his (his their) Attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign the specification and drawings, to receive the Patent and to transact all business in the Patent Office connected therewith.

THAT the allegations made in this petition are verified on oath as required by The Patent Act, 1935.

YOUR petitioner therefore pray that a patent may be granted to him (him or them) for the said invention

SIGNED AT Brussels, THIS 19th

DAY OF September, 1939.

Elie Aghnides

(Signature of inventor or inventors)

2 App. 324 Canadian File Wrapper

Oath

THE PATENT ACT, 1935

(FOR EXECUTION BEFORE FILING APPLICATION)

I, Elie AGHNIDES, citizen of Greece, formerly

of 14 Blvd. de Waterloo, Brussels, Belgium, and presently of 527 Lexington Avenue, New York City, N.Y. United States of America, and whose occupation is

make oath and say:

1. That I am (a) the inventor of an invention entitled

~~" DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE"~~ Fluid Mixing

for which I solicit a patent by petition ~~dated~~ filed the 15th day of November 1939

2. That I verily believe that the said invention was not known or used by others before it was invented as aforesaid and will have neither been in public use or on sale in Canada, nor described in any patent or in any publication printed in Canada or in any other country, more than two years before the filing of the said application.

3. That no patent for the said invention has issued or will issue to me or any legal representatives prior to the filing of my said application (*b*) except as a result of the application specified in the request for priority in my said application.

4. (c) That no application for a patent for the invention as defined in the claims specified in the request for priority in my said application has been made by me or any one claiming under me before the date of the earliest application specified in such request.

5. That the several allegations contained in the said application are respectively true and correct.

SWORN BEFORE ME AT
New York. N. Y.

this 7

day of May. 1947

Elie Aghnides
(Inventor's Signature)

Gertrude M. Reiner

GERTRUDE M. REINER
Notary Public in the State of New York
Residing in Queens County
Queens Co. Clk's No. 1977
Certificates Filed in
N. Y. Co. Clk's No. 647, Reg. No. 217-R-9
Commission Expires March 30, 1949

(a) *If more than one inventor insert the words "one of" and add (s) to word "Inventor" [illegible] oath for each Inventor is required.*

(b) *Delete to end of paragraph if no claim for priority is made or if no patent issued prior to [illegible] application.*

(c) *Delete paragraph if no claim for priority is made.*

(d) *Signature of inventor.*

(e) *Signature of person administering oath. Official Seal must be affixed.*

(f) *Official capacity of person administering oath. Notary Public, Judge or other officer for taking affidavits*

Important: The oath must be sworn not earlier than thirty days before the date of the filing of the petition. If the Jurat is in any other language than English or French a certified translation must be supplied. Legalization is not necessary

Canadian File Wrapper 2 App. 325

S P E C I F I C A T I O N

TO ALL WHOM IT MAY CONCERN :

Be it known that ELIE AGHMIDES, a citizen of Greece and resident of Brussels, Belgium having made an invention entitled:

"FLUID MIXING DEVICE"

the following is a full, clear and exact disclosure of the nature of the said invention and of the best mode of realizing the advantages thereof.

490112

This invention relates to apparatus for the intimate mixture of the ambient air with water flowing under pressure, and consisting of an upper part forming injector for the intake of the air by the water under pressure, and an outlet, and comprising between this outlet and the injector a dividing mixer through which the two fluids water and air are forced to pass, According to the purpose of the invention, such apparatus are essentially meant to be fitted at the outlet of a tap for the distribution of the town's water supply.

In certain known contrivances of this type, the dividing mixer is made up of projections, bafiles, steps, or other radial devices, or otherwise disposed, on which the jets of both fluids come to be broken up so as to determine a more or less intimate intermixture of both fluids. In these devices, the jet leaving the apparatus has no cohesion, it is exactly like an ordinary water jet in appearance, the air which is mixed escaping immediately at the outlet.

C

In other known apparatus, the dividing mixer consists of a plate with relatively large perforations, which gives the same result as that obtained by means of projections or of baffles.

Further, a device of this type is known in which the divider is formed by at least one plate with extremely fine holes, of a capillary character; these holes which are very tiny, determine according to the characteristic features of this apparatus, a real

atomisation or pulverisation of the air, which is thus divided in such tiny particles that they momentarily escape to the law of gravitation, and they furnish a water jet of grey appearance, which is flat, not frothy, containing a very weak proportion of air which remains in suspension in this water during a more or less long period of time.

In a general manner, the known devices meant to "aerate" the water, fail in their object, because they supply a jet in which the air, carried along in the shape of big bubbles, escapes immediately at the outlet of the apparatus, or else the air is so finely divided up in them in such very minute particles that the percentage of air carried along is extremely small and gives to the jet an appearance which is disagreeable and not appetising.

I have found that it is possible, by simple and cheap means which are not cumbersome, to obtain a jet with a big propertion of air (up to 30-60 % of the total volume), in which the air remains in suspension in the shape of fine bubbles which impart a snow-white colour to it, this jet, which is soft to the touch, being essentially frothy, very light, non-splashing, quite cylindrical and regular. Such a jet with a soap solution gives an abundant froth, which is compact and resistant, never obtained up till to-day ; poured into a glass, this jet fills the glass, then in a few minutes, through the escape of the air which it contained, only occupies 40-70 % of the initial volume, which proves the enormous quantity of air carried in the jet.

As stated, the apparatus, according to the invention consists of an upper part forming injector, and below this, a dividing mixer. The latter consists of one or more perforated devices or of screens superposed or else disposed step-wise, and according to the invention, this dividing mixer must, to give the new result, that is to say a jet which is stable, frothy and of a snow-white colour - result which until now had never been sought for - answer at one and the same time to the three

following fundamental conditions :

a - the passages across the dividing mixer, at the place where the section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm.

b - the total height of the said passages, without taking into account the eventual intervals between the elements disposed step-wise, must not exceed 30 times the value of the diameter of the circular section to which the section of the passages corresponds.

c - the passages must be so close together that the suction zone of each jet coming out of any passage whatever cuts the suction zone of the neighbouring jets, or must at least be at a tangent with it.

As non-limitative example, a contrivance giving good results has been obtained by using 3 N° 40 screens (40 wires of 0,23 mm. section per inch, with an interspace of 1 mm. between each other, placed at 5-10 mm. beneath a perforated plate having 32 holes of 8/10 of a mm. in diameter and on an exit vent or outlet restricted to a 17 mm. diameter.

The first of the conditions aims at obtaining a division of the air such that sufficiently small bubbles are obtained in the jet, that is to say having the tendency of remaining in a suspended state in the jet ; below these dimensions one falls into apparatus for atomising the air, and above, one obtains bubbles which are too big, which burst immediatly and escape from the jet at the outlet of the apparatus. These passage dimensions, can evidently be obtained by means of the superposition of screens with larger holes, where the holes do not exactly coincide over the entire height of the passages.

The second condition aims at obtaining a full jet, with a large proportion of air. The greater the height of the dividing device, the greater is the resistance which it offers to the passage of the two fluids ; beyond a certain resistance, the

quantity of air carried away decreases, and the apparatus loses some of its interest.

The third condition aims at obtaining a coherent well and plain jet, in which the air bubbles are imprisonned in the jet; it equally aims at decreasing the resistance offered by the mixing means.

These three essential conditions can give birth to quite a series of interesting embodiments, either applied by themselves, or in combination with other constructive characteristics, as will be brought out in the following description made with reference to the annexed drawings, in which:

Fig. 1 is an axial section of a first embodiment.

Fig. 2 is the same section of a variant.

Fig. 3 is a section according to III-III of Fig. 2.

Fig. 4 is a section of another variant.

Fig. 5 is a section of still another variant.

Fig. 6 is a section of a variant to be connected with a flexible connector.

Fig. 7 is a section according to VII-VII of Fig. 6.

Referring to Fig. 1, 1 designates an ordinary household tap, and 2 is a connection for the tap; this connection is of known construction, 4 is the body of the mixing-divider. The perforated plate 6 allows the water to pass into the chamber 4 in the form of a large number of little jets, a series of passages 8 are provided for the admission of the external air into the chamber 4, through the action of the jets coming out of 6. 10 designates a screen or sieve at the lower part of the body 4, above a narrowed outlet 12. The screen 10 consists of a sieve with passages, the section of which corresponds with that of a circle the diameter of which is included between 0,05 mm. and 2,5 mm., and which answers to the three essential conditions previously indicated. The contraction 12 at the outlet also offers

a great interest from the point of view of the regularity of the jet which is escaping, and of the beauty of this jet.

In the example shown in Fig.2, a metallic envelope 14 is screwed directly onto the tap 1. This envelope sustains the perforated plate 16 against the outlet of the tap, and it contains a divider consisting of three sieves 18 disposed step-wise or directly superposed. A series of passages 20 is provided for the admission of the air.

In this example, the plate 16 is only provided with a single central hole. The envelope 14 also has a contracted outlet.

In Fig.4, the envelope 3 is equipped with a connector 6 meant to connect it with an ordinary tap. The perforated plate 7 is fastened between the envelope 3 and the outlet of the tap ; the air is admitted through perforations 9. The divider consists of two sieves 11 and 13.

In Fig.5, the perforated plate 15 carries a series of holes towards the peripnery, and the envelope 17 is provided with internal projections 19. The main part of the water passing through 15 strikes these projections and is broken up, and is already mixed with the air sucked in by the openings 21. Here, the divider consists of two sieves lodged in a contracted part 22 of the envelope 17.

In Figs.6 and 7, a perforated plate 23, provided with a single central hole, or with peripheric holes, or with holes uniformly distributed, is fitted in a notch in a rubber connector 24, of which the external cylindrical face is provided with longitudinal grooves 25 for the admission of the air. The envelope 26 is clamped on this connector and has three spaced sieves 27, and a contracted outlet 28. In the centre of the connector 24 a rigid tube 29 is rigidly fitted, so as to receive a flexible tube 30 which is to be connected with a source of water under pressure.

Having now fully described my invention, what I claim and desire is to secure by letters patent is:

1. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

A

2. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and means for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet.

7

3. A device for producing a coherent jet of water containing air bubbles, comprising a chamber, the inlet end of which is adapted for connection with the discharge end of a tube containing water under pressure and the outlet end of which is adapted to discharge the said coherent jet, a diaphragm at the upstream end of the chamber having at least one orifice through which the stream of water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the stream of water, and means, in the path of the stream of water after it leaves the orifice and before it discharges at the outlet end, for finely breaking up the water and for offering sufficient resistance for thoroughly mixing it with air and for thereafter uniting the aerated water to form a coherent jet having small bubbles disseminated throughout the jet, the resistance offered by the said means and the cross sectional area of the orifice being proportioned to effect the entrainment and mixing of the air with water before their discharge from the said outlet end.

4. The device of claim 1 in which the said means comprises a screen at the discharge end of the chamber, the openings in which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

5. The device of claim 1 in which the said means comprises superposed screens, the screen at the discharge end of the chamber having apertures which are sufficiently close together so that the streams of aerated water issuing therefrom immediately join each other to form a single jet.

SIGNED AT Brussels, this 19th day of September 1939.

Elie Aghnides (d)
(Inventor's Signature)

Oath

THE PATENT ACT, 1935

(FOR EXECUTION BEFORE FILING APPLICATION)

I, Elie AGHNIDES, a citizen of the Greek Republic and resident of Brussels, Belgium, 14, Boulevard de Waterloo,

and whose occupation is Engineer

make oath and say:

1. That I am (a) the inventor of an invention entitled Device for intimately mixing air with water flowing under pressure

for which I solicit a patent by petition dated the 19th day of September 1939.

2. That I verily believe that the said invention was not known or used by others before it was invented as aforesaid and will have neither been in public use or on sale in Canada, nor described in any patent or in any publication printed in Canada or in any other country, more than two years before the filing of the said application.

3. That no patent for the said invention has issued or will issue to me or my legal representatives prior to the filing of my said application (b) except as a result of the application specified in the request for priority in my said application.

4. (c) That no application for a patent for the invention as defined in the claims specified in the request for priority in my said application has been made by me or any one claiming under me before the date of the earliest application specified in such request.

5. That the several allegations contained in the said application are respectively true and correct.

SWORN BEFORE ME AT

Brussels, Kingdom of Belgium,

this 19th

day of Spptember, 1939.

Elie Aghnides (d)

COMMERCIAL ATTACHÉ · CANADIAN LEGATION · BRUSSELS

Yves Lamontagne (e)

COMMISSIONER OF OATHS FOR CANADA
IN BELGIUM (f)

(a) *If more than one inventor delete the words "one of" and add (s) to word "Inventor". A separate oath for each application executed.*
(b) *Delete to end of paragraph if no claim for priority is made or if no patent issued prior to filing this application.*
(c) *Delete paragraph if no claim for priority is made.*
(d) *Signature of inventor.*
(e) *Signature of person administering oath. Official Seal must be affixed.*
(f) *Official capacity of person administering oath. Notary Public, Judge or other officer for taking affidavits.*

Important: The oath must be sworn not earlier than thirty days before the date of the filing of the petition. If the Jurat is in any other language than English or French a certified translation must be supplied. Legalization is not necessary.

Can 776
(211

Fig.1

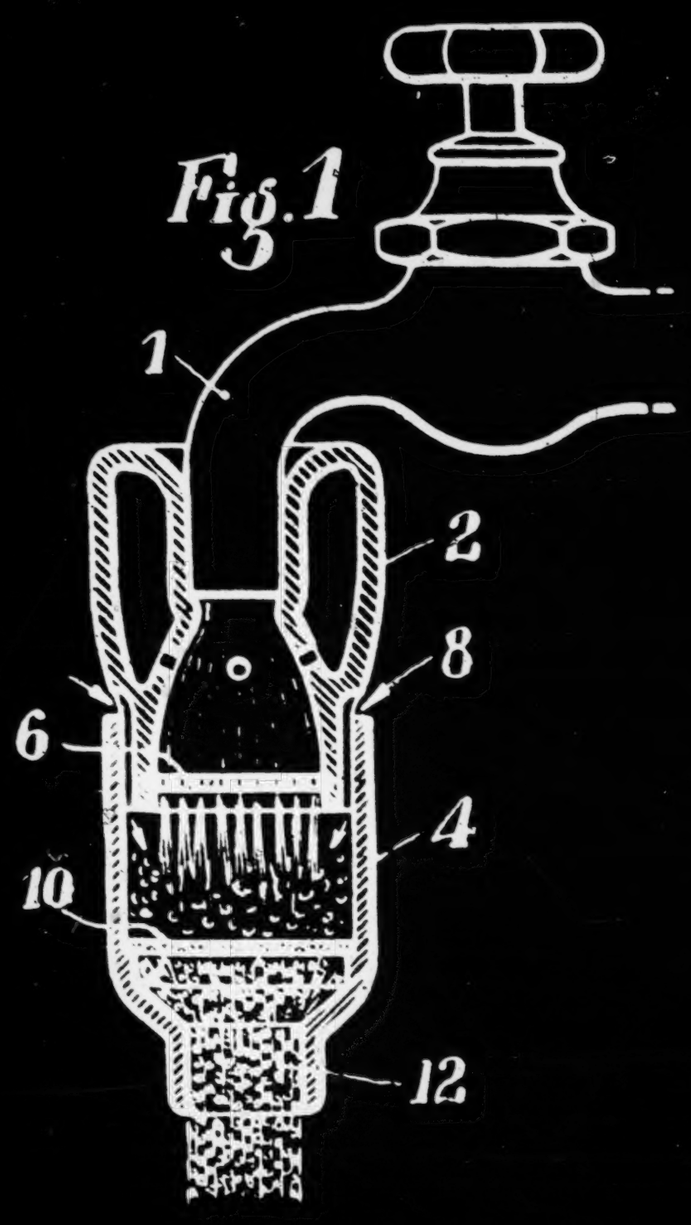


Fig.4

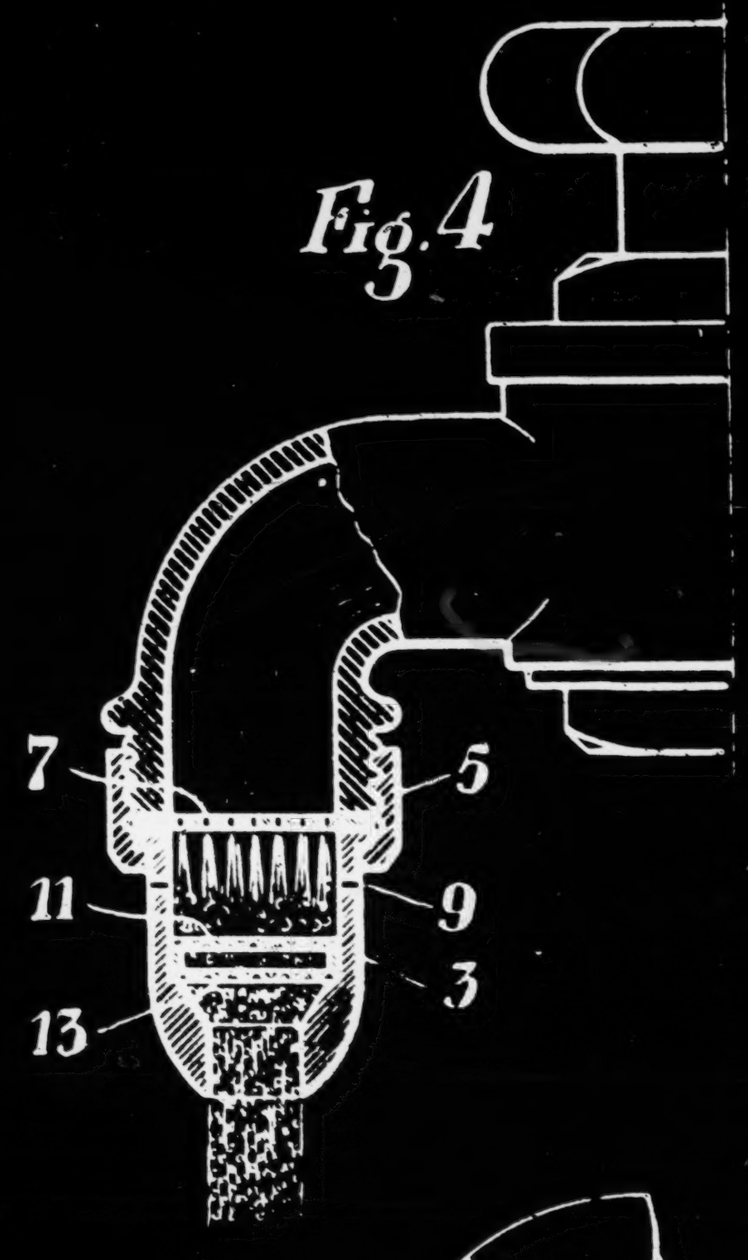


Fig.2

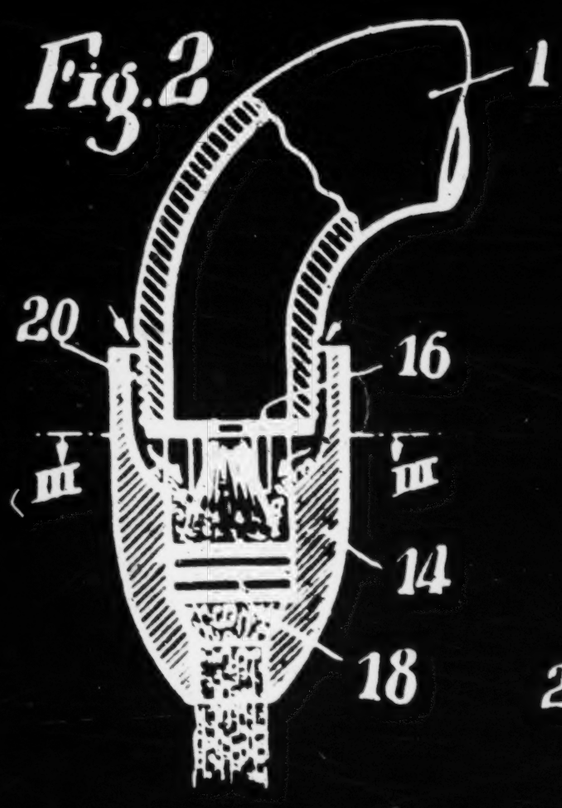


Fig.5

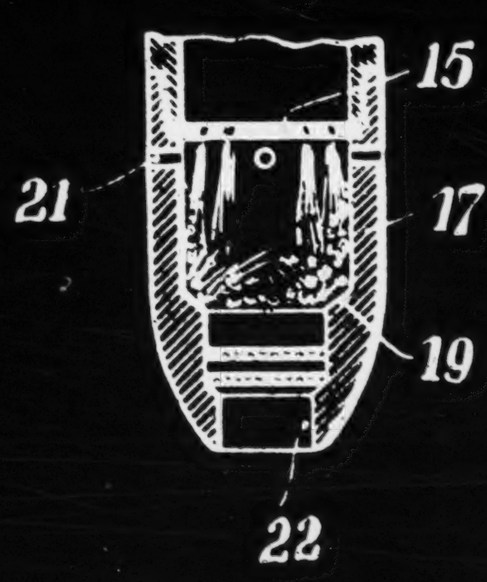


Fig.6

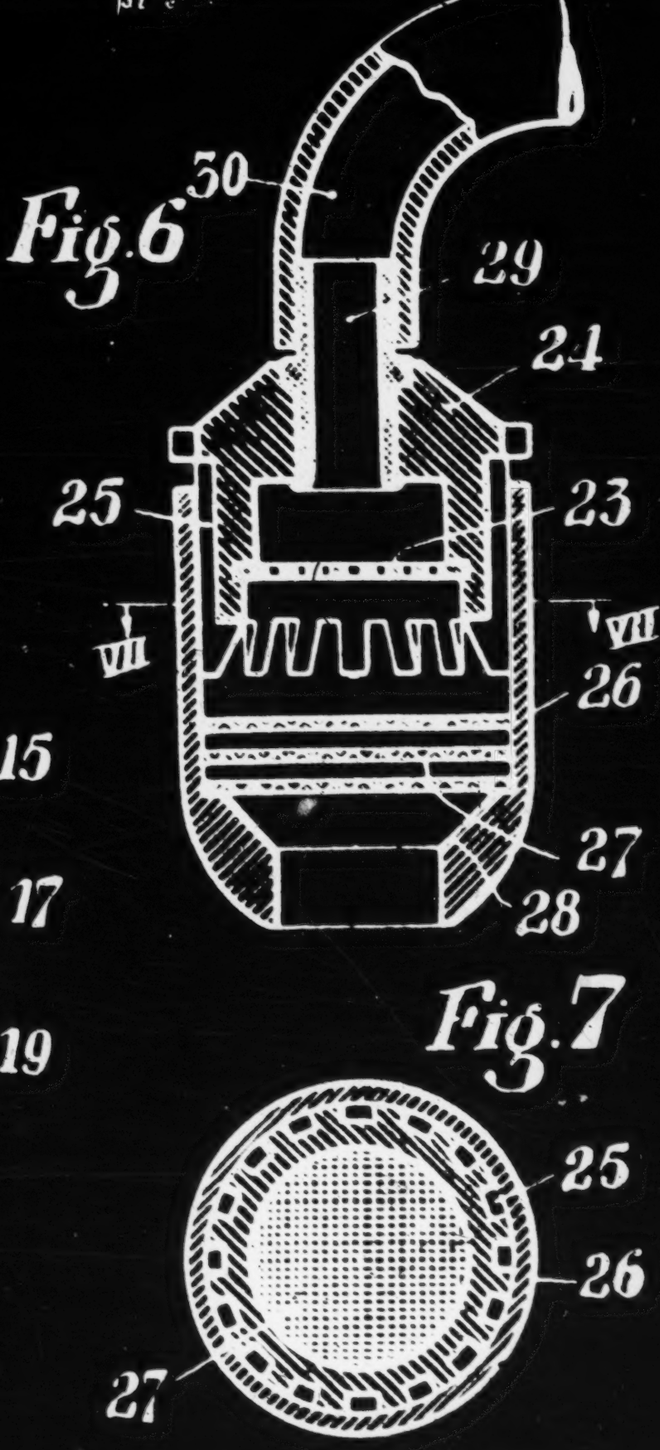


Fig.3

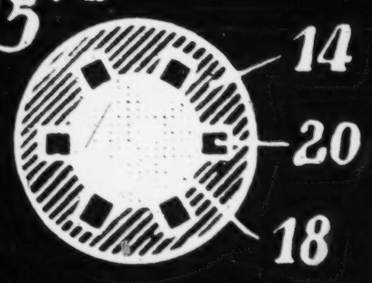


Fig.7

Witnesses :

Certified to be the drawings referred to in the specification hereunto annexed.
Signed at MONTREAL, Can. Nov. 14, 1939.

Inventor
Elie AGHNIDES

By Marion & Marion
Attorneys.

PATENTS & COPYRIGHT OFFICE
NOV 16 1939
ACCOUNTANT

M A R I C N & M A R I O N

Patent Attorneys

Postal Address
(Box 390, Station B)

1255 University Street,

MONTREAL, Can.

November 14, 1939.

TO THE COMMISSIONER OF PATENTS,

OTTAWA,

ONT.

SIR,

Attached herewith please find the necessary papers for a patent application, the particulars of which appear below, with a check to cover the filing fees.

....

....

Priority is claimed as follows: ... .

....

....

Yours respectfully,

Marion & Marion

Case No.

Name of Inventor: ELIE AGHNIDES Attorneys.

Title of Invention: Device for intimately mixing air with water flowing under pressure.

Priority Data (if any) none

Fee: $ 15.00

DUPLICATE

CANADA

No. 909135

Department of the Secretary of State — Patent and Copyright Office

Département du Secrétaire D'État — Bureau des brevets et droits d'auteur

Received from / Reçu de: Elie Aghnides — November 15, 1939

the sum of / la somme de: Fifteen Dollars

in payment of the fee on / en paiement des honoraires dûs sur: Filing

$ -15.00 (2401)

Serial No. / No. de Série

M. J. Birchall

Accountant / Comptable

Canadian File Wrapper 2 App. 337

490112

PATENT AND COPYRIGHT OFFICE

COMMUNICATIONS SHOULD BE ADDRESSED
THE "COMMISSIONER OF PATENTS"
"OTTAWA"
WHEN WRITING ON THIS SUBJECT REFER TO
SERIAL NUMBER OF APPLICATION

CANADA

PATENT OFFICE

OTTAWA, November 22, 1939

Applicant Pio Aglnides

Title of invention Device for Intimately Mixing Air with Water Blowin under Pressure

Filing date Nove[illegible] 18, 1939

Serial number 468,775

Gentlemen:

You are hereby advised of the filing of the above application for patent.

Your obedient servant,

J T Whitehell
Commissioner.

To [illegible]

[illegible]

[illegible]

CIRCULAR No. 1
1[illegible]-17-7-39

COMMUNICATIONS SHOULD BE ADDRESSED
"THE COMMISSIONER OF PATENTS"
"OTTAWA"
WHEN WRITING ON THIS SUBJECT REFER TO SERIAL NUMBER OF APPLICATION

PATENT AND COPYRIGHT OFFICE

CANADA

PATENT OFFICE

OTTAWA, November 25, 1939

Serial No. 468776

Filed Nov. 15, 1939

Applicant Elie Aghnides

Title Device for Intimately Mixing Air with Water Flowing under Pressure

Gentlemen;

Referring to the above application I beg to inform you that the oath executed September 19, 1938 is not acceptable under Rule 13. A new oath is required.

Attention is respectfully directed to Rule 21 of the Rules, Regulations and Forms, 1935.

Your obedient servant,

J T Mitchell

Commissioner

To Messrs. Marion & Marion,
Box 390 Station "B",
Montreal, Que.

CIRCULAR 2
2-8-38

P. O. BOX 368, STATION "B"

MONTREAL, May 9th, 1947

PATENT & COPYRIGHT OFFICE
MAY 10 1947
ACCOUNTANT

HON. COMMISSIONER OF PATENTS,

O T T A W A ,

Ont.

re: Elie AGHNIDES - Can.Pat.Appln. No. 468,776 - "DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE."

S I R :-

As requested by your letter of November 25th, 1939, attached herewith please find a new Oath.

It is to be noted that this application became abandoned through failure to complete the same within twelve months from its date of filing, namely on or before November 15th, 1940. We also submit herewith an affidavit executed by the applicant, showing that the delay in completing the application, is obviously due to war conditions, and consequently it is respectfully asked that it be reinstated under the authority of Section 9 of the Patents, etc., Emergency Order, 1939.

Yours respectfully,

MARION & MARION

Per: [signature]

Attorneys.

JAB/MD.

ENCL.

49011

Time to complete papers
Extension of time to May 10, 1947
given under authority of Sec. 9
of The Patents, Designs, Copyright
and Trade Marks (Emergency) Order,
1939. J. T. Mitchell
Commissioner

5/5/47

Affidavit

I Elie AGHNIDES, citizen of Greece, formerly 14 Blvd. de Waterloo, Brussels, Belgium and presently 527 Lexington Ave. New York 17, N.Y., United States of America, hereby depose upon oath and state as follows:

that it was beyond my control to follow the application No. 468,776 filed on November 15th 1939 in Canada, for "Device for Intimately Mixing Air with Water Flowing under Pressure";

that I left Belgium in October 1939 and my country was invaded by Italy in October 1940;

that due to war my funds were blocked and communication with my patent attorney in Belgium was impossible;

that when after the end of the war I decided to continue the above mentioned patent application in Canada No. 468,776 and wrote to my Belgian patent attorney Mr. D. Jeunehomme, Office des Inventions, 63 Blvd. E. Jacqmain Brussels, Belgium;

that due to war the Office des Inventionswas disorganized and many documents were lost;

that further delay was caused by the sudden death of Mr. D. Jeunehomme and because his successors Office Kirkpatrick in Brussels, Belgium informed me only recently that I should write directly to Messrs. Marion & Marion of Montreal, Canada who were the Canadian Agents of the Office des Inventions and possessed all the documents relative to the above mentioned patent application.

In witness whereof I have signed this affidavit.

SWORN BEFORE ME AT
New York. N.Y. this
7 day of May, 1947
Gertrude M. Remier

Elie Aghnides

GERTRUDE M. REIM[illegible]
Notary Public in the State of New York
Residing in Queens County
Queens Co. Clk's No. 2977
[illegible]

Canadian File Wrapper 2 App. 341
490112

P. O. BOX 368, STATION "B"

MONTREAL, May 16th, 1947.

HON. COMMISSIONER OF PATENTS,

O T T A W A ,

Ont.

re: Elie AGHNIDES - Can.Pat.Appln.
No. 468,776 - DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE.

S I R :-

The applicant desires to incorporate in the above application, claims corresponding to his United States patent or patents as the case may be.

Consequently, it is respectfully asked that one of the duplicate copies of the specification, claims and drawings on file, be sent to us, so that a proper amendment of the claims may be made thereto and filed in accordance with applicant's request.

Yours respectfully,

MARION & MARION

Per: J. A. Hostein

Attorneys.

J.B/M.D.

2 App. 312 Canadian File Wrapper

PATENT AND COPYRIGHT OFFICE

COMMUNICATIONS SHOULD BE ADDRESSED
"THE COMMISSIONER OF PATENTS"
"OTTAWA"
WHEN WRITING ON THIS SUBJECT REFER TO
SERIAL NUMBER OF APPLICATION

CANADA

PATENT OFFICE

OTTAWA, May 30, 1947

Application Serial No. 468,776
Applicant Elie Aghnides

Gentlemen,-

I have the honour to acknowledge the receipt of your letter of the 16th instant,

and in reply to inform you that as requested, I am returning herewith the duplicate papers in the above application. I may point out, however, that this application has become completely abandoned, the required oath not having been filed within the prescribed period.

Your obedient servant,

J. T. Mitchell
Commissioner

To Messrs. Marion & Marion,
Box 368, Station "B",
Montreal, Que.

CIRCULAR NO. 6
10 000 - 4-47

Canadian File Wrapper 2 App. 343
490712

MARION & MARION
(ESTABLISHED 1902)
PATENT ATTORNEYS
SOLLICITEURS DE BREVETS D'INVENTION.

RAYMOND A. ROBIC
J. ALFRED BASTIEN

CASIER NO
P. O. BOX 368 STA. "B"
MONTREAL, 2.

June 16th, 1947

PATENT & COPYRIGHT OFFICE
JUN 17 1947
ACCOUNTANT

HON. COMMISSIONER OF PATENTS,
O T T A W A ,
Ont.

re: ELIE AGHNIDES - Can.Pat.Appln. No. 468,776 - "DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE".

S I R :-

By your letter of the 30th ult., we are advised that this application is completely abandoned.

Before filing an amendment, we would like to know if this decision was rendered after consideration of our petition dated May 9th, accompanied with an affidavit praying for the reinstatement of this case under Section 9 of the Patents, Emergency Order, 1939.

Thanking you for an early reply, we are,

Yours very truly,

J. A. Bastien.

JAB/MD.

468,776

August 26, 1947.

Gentlemen,-

Referring to application for patent Serial No. 468,776 in the name of Elie Aghnides, for "Device for Intimately Mixing Air with Water Flowing under Pressure", I beg to advise that in view of the statements contained in the affidavit received with your letter of May 9th, 1947, the time within which to complete the papers in the case has been extended under authority of Section 9 of the Emergency Order.

The application has been referred to the examiner for consideration.

Your obedient servant,

Commissioner of Patents.

Messrs. Marion & Marion,
Box 368, Station "B",
Montreal, Quebec.

Canadian File Wrapper 2 Apr. 45
490.12

MARION & MARION
(ESTABLISHED 1892)
PATENT ATTORNEYS
SOLLICITEURS DE BREVETS D'INVENTION

RAYMOND A. ROBIC
J. ALFRED BAZIEN

CABLE ADDRESS P. O. BOX 368 STA. "B"
MONTREAL, 2.

COPYRIGHT OFFICE
SEP 8 1947
ACCOUNTANT

September 5, 1947.

IN THE CANADIAN PATENT OFFICE

In the matter of the application of

Elie AGHNIDES

For a patent upon: "DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE"

Filed Nov. 15, 1939: Ser.No. 468,776.

AMENDMENT BEFORE ACTION

HON. COMMISSIONER OF PATENTS,
O T T A W A, Ont.

SIR:

Herewith are returned the duplicate specification papers for the above application, together with new claims in triplicate to be substituted for those of record.

A

R E M A R K S

Applicant desires to change the title of the present invention to "FLUID MIXING DEVICE", and it is respectfully requested that this title be substituted for that of record.

Considering the nine claims presented herewith by applicant, it is pointed out that these claims are identical with those of United States Patent Nos. 2,210,846 and 2,316,832 to applicant covering the present invention.

The first of the above patents contains claims corresponding to new claims 1-5, and the second contains claims corresponding to new claims 6-9.

The application resulting in United States Patent No. 2,210,846 was filed December 31, 1937. Against this application the Examiner cited the patents to Haisman et al, British 7,005 of March 22, 1913 and to Friedrich U.S. 2,003,184 of May 28, 1935.

Elie Aghnides. Ser. No. 468,776.

On June 18th, 1940, the United States Board of Appeal reversed the Examiner's decision and discarded both the above references, and a patent was issued August 6, 1940.

The application resulting in U.S. Patent No. 2,316,832 was filed on April 5th, 1940, as an improvement in applicant's original device and was granted on April 20th, 1943.

The devices covered by the claims of these two patents are disclosed both in structure and function in the present Canadian application, and it is therefore believed that the inclusion of the present claims renders this application allowable.

A favourable action is accordingly solicited.

RESPECTFULLY SUBMITTED,

Elie AGHNIDES

by: Marion & Marion
Attorneys.

LW:EF
Enc.

Having now fully described my said invention, what I claim and desire to secure by letters patent is:

1. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

2. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is made of superposed perforated screens, the whole of which answers at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the

suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

3. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is made of staggered, but non contacting perforated screens, the whole of which answers at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm,

b) the total height of these passages without taking into account the intervals between the staggered screens exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

4. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of a least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30

times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

5. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

6. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion formed of a transverse plate with a single central hole, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular

section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

7. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper plate perforated at its periphery only and forming part of an injector portion, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following conditions:

A

a) the passages across the dividing member, at the place where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm,

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

8. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion, a restricted passage above said perforated plate, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following

fundamental conditions :

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm. ;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above ;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

3. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion, a uniformly perforated plate above this injector portion, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions :

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm ;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above ;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

4. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion formed of a transverse plate with

a single central hole, a uniformly perforated plate above said plate, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

11. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper plate perforated at its periphery only and forming part of an injector portion, a uniformly perforated plate above said plate, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

12. Device for intimately mixing air with water flowing

under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets., and wherein the body of the device comprises peripherical internal projections below the injector portion, and a restricted outlet for the reception of the dividing and mixing means.

13. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion tightened between the upper side of the device and the faucet to which the device is connected, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

14. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion maintained in a groove of the device's body, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

15. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion maintained in a connector between the device and a faucet, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three

following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

16. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is made of superposed perforated screens maintained in a rigid ring, the whole of which answers at one and the same time to the three following fundamental conditions:

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

17. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper injector portion, a dividing and mixing part and an outlet for the jet, wherein the dividing and mixing part is

made of staggered, but non contacting perforated screens, maintained in a rigid ring, the whole of which answers at one and the same time to the three following fundamental conditions :

a) the passages across the dividing member at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm ;

b) the total height of these passages without taking into account the intervals between the staggered screens exceed 30 times the value of the diameter specified at a above ;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets.

18. Device for intimately mixing air with water flowing under pressure, for obtaining a coherent jet wherein a large proportion of air is imprisonned in form of very small bubles tending to remain in suspension in the jet, this device comprising an upper perforated plate forming part of an injector portion, a dividing and mixing part and a restricted outlet for the issuing jet, wherein the dividing and mixing part is made of at least a perforated screen answering at one and the same time to the three following fundamental conditions :

a) the passages across the dividing member, at the plan where their section is smallest, must correspond to a circular section of a diameter included between 0,05 and 2,5 mm ;

b) the total height of these passages must not exceed 30 times the value of the diameter specified at a above ;

c) these passages must be so close together that the suction zone of each jet coming out of any passage whatever is at least tangent with the suction zone of the neighbouring jets, the dividing and mixing part being supported on an internal shoulder of the device's body ; and the perforated plate of the injector portion being supported by a ring carried by the dividing and mixing part, holes in the upper part of said ring, holes in

the device's body, and a connecting part between a faucet and the device's body, whereby the tightening of this device's body on this connecting part produces the tightening of the dividing and mixing part, of the injector portion and of the ring between the mixing part and the injector portion.

CANADIAN PATENT OFFICE

2 App. 358 Canadian File Wrapper

490112

MARION & MARION
(ESTABLISHED 1892)
PATENT ATTORNEYS

SOLLICITEURS DE BREVETS
D'INVENTION.

RAYMOND A. ROBIC
J. ALFRED BASTIEN

CASIER No
P. O. BOX 368 STA. "B"

MONTREAL, 2 October 12th, 1949.

HON. COMMISSIONER OF PATENTS .

OTTAWA

ONT.

RE:-ELIE AGHNIDES - Can.Pat.App.Ser. No. 468,776 - Filed November 15th, 1939 for "DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE".

S I R :-

Kindly advise us when an action may be expected in the above entitled application.

YOURS RESPECTFULLY,

MARION & MARION,

Attorneys.

JOB/LB.

Elie Aghnides,

per

Messrs. Marion & Marion,
Montreal, Que.

Patent Office
CANADA

Ottawa NOV 8 1950

Please find papers herewith enclosed, and below a communication from the Examiner in charge of your application, Serial No. 468,776 *for*

DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE

Any communication respecting this application should give the serial number and should be addressed to "The Commissioner of Patents, Ottawa."

J T Mitchell
Commissioner

It is noted that the present claims conform to Applicant's two United States Patents, Nos. 2,210,846 and 2,316,832. However, a discrepancy is noted in the convention dates upon which the Canadian and United States cases are based. The Canadian application claims priority in view of Holland and Swedish applications of June, 1939. The United States bases priority on a Belgium application filed in December 1934. In view of the requirements of Section 27 subsection 1 of the Patent Act, an explanation of the above circumstances is requested.

The Applicant is further requested to advise this Office of the status of the corresponding Belgium case of December, 1934 -- if this application has issued to patent, the patent number and date of issue are required.

The present application is refused in view of Applicant's British Patent 468,687, dated July 6, 1937. Attention in this regard is directed to Section 27 subsection 2 of the Patent Act.

Division 8

2 App. 360 Canadian File Wrapper

MARION & MARION
(ESTABLISHED 1892)
PATENT ATTORNEYS
SOLLICITEURS DE BREVETS D'INVENTION.

RAYMOND A. ROBIC
J. ALFRED BASTIEN

CABIER NO
P. O. BOX 368 STA. "B"
MONTREAL, 2, MAY 5 1951

IN THE CANADIAN PATENT OFFICE

In the matter of the application of
ELIE AGHNIDES
For a patent upon an improvement in
"DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE"
Filed November 15th, 1939; Ser.No. 468,776

AMENDMENT

THE HON. COMMISSIONER OF PATENTS,
O T T A W A,
ONT.

S I R :-

This is in response to Official Action dated November 8th, 1950 in the above matter. The duplicate papers are returned herewith.

- R E M A R K S -

The priority question raised by the Examiner is based, of course, on the foreign applications claimed as Convention dates in the Oath filed with the present specification, namely:

Holland, June 22nd, 1939
Sweden, June 26th, 1939.

Consequently, said applications were subsequent to the filing of the United States patent No. 2,210,846 which, at the date of filing, claimed the Belgian application of 1934.

There is an important fact to remember, however; the said Belgian 1934 application did not disclose fully the bubbly-stream principle disclosed in Holland, Sweden, the United States patent No. 2,210,846, the instant Canadian case and British Specification No. 625,084.

It is only in December 1937 that the ways and means of making a bubbly-stream were disclosed when the United States text (application No. 182,884) was rewritten, although the Convention Belgian application did mention the emulsion of air in a water stream.

Therefore, the priority claims in the present case are correct and support properly the instant disclosure: it is the Belgian Convention which, in the United States patent No. 2,210,846 confuses the issue because, actually, said Belgian case does not teach the bubbly-stream as it is known to-day.

B

The same remarks apply also to the British Specification No. 468,687 which was filed December 4th, 1935, prior to the first disclosure of the bubbly-stream in United States, December 1937.

As a matter of fact, the British Examiner, during prosecution of British Patent No. 625,084, embodying the principle presently claimed, did oppose the Applicant's prior patent No. 468,687 as pertinent art. Upon presenting proper factual arguments, and submitting a model showing the differences between the two applications, the citation was withdrawn and patent No. 625,084 issued.

Applicant is prepared to submit this exhibit to the Canadian Examiner, if necessary and, as a matter of interest, reproduces below textually the argument presented to the British Examiner:

"The British patent specifies on page 2, line 7, that the device has "an atomizing and mixing portion", and on lines 11 and 12, that "the particles of liquid and air in intimate contact with each other even after issuing from the said device". This statement is confirmed in claim 1 of this British patent, as well as the fact that the pressure is uniformly distributed throughout the cross section of the stream. On line 20 of page 2, it is again specified that the perforated plate, or plates, atomizes the air and liquid. On page 3, lines 7 and 8, it is specified that with soap this device produces a very foamy emulsion. It is clear that atomization of a fluid or emulsion of a fluid means reduction of that fluid into particles of extremely small size. Such particles escape to the law of gravitation. For instance, when air is atomized or emulsified into water, the water will become gray and stay gray for awhile, even though the great difference in density of air and water should create an instant separation of the two fluids. Because such instant separation does not take place, Aghnides' patent specifies in the claim that the contact between air and water is intimate "even after issuing from the device". Another statement in the patent, which illustrates well how little air is drawn through the device and how well the air drawn is atomized, proves that the device is suitable for drawing beer (page 3, lines 12 and 13). Indeed, if the amount of air drawn through the device was substantial, and the particles formed by said air were big enough to form bubbles instead of being mere emulsion particles, it would be utterly impossible to draw any beer through this device because, due to the froth-producing property of the beer, a substantial amount of air, divided into particle size forming bubbles, would fill the glass with froth and nothing else.

B

The fact that the patent issued did not have the purpose to mix a great volume of air with water, which merely emulsified air in the water -- and the volume of air that can be emulsified in the water is very limited -- is proven also by the character of the drawings shown in this patent. Thus, it will be seen that in the abandoned figure 6 there was a water softener in the path of the air and the water The water softener obviously presented such resistance that only very little air could be entrained through by the force of the water under pressure. Likewise, in figures 2, 3, 4 and 5, the distance between the injector portion (element 5) and the mixing portion is relatively speaking great. This means that, by the time the water strikes a perforated plate, it has already lost a part of its force, and less air is therefore entrained through the perforated plates.

Aghnides discovered that if the device of patent 468,687 is proportioned differently, even though it would appear pictorially the same, it will produce an entirely different result. This discovery is described in his application 18571/38. (Application 18571/38 matured into the British patent No. 625,084). In this application the new principle is fully explained and the resultant jet is white (page 2, line 25). The new jet is white in color because the amount of air contained in the jet is considerable, and, on the other hand, it is specified that the air bubbles (page 2, line 17) have " a tendency to remain in suspension in the jet". It is clear, or, at least it is a fact, that it is a question of bubbles and also a question of a white stream, and these statements tell to those skilled in the art that the bubbles will not stay in "intimate contact with each other long after issuing from the said device".

Applicant claims that it is not obvious for one in possession of a device as per his patent 468,687 that he may so modify the device as to transform it into one that delivers bubbly-white stream. Indeed, this discovery alone would not have any meaning if the applicant had not discovered that the bubbly-white stream has extraordinary and new properties such as those described in the attached folder.Bubbles have been seen by millions of people during centuries, but no-one suspected their properties so as to conceive a very practical and simple means, as those described in said application, for the benefit of the industry and of the public at large. Those chemists and engineers often saw laboratory water pumps delivering air and water mixed and some bubbles accidentally created, but none even suspected how valuable those bubbles could be."

It is believed that the present explanation will convince the Examiner that the present application is correctly based on the proper convention dates, and that the apparent discrepancy of the United States patents is due to special reasons not specifically applicable to the instant matter.

Favorable reconsideration is solicited.

RESPECTFULLY SUBMITTED,

ELIE AGHNIDES,

BY:

Marion & Marion
Attorneys.

JOB/LB
ENCL:
MAY 4TH, 1951.
MONTREAL CANADA.

EXCLUSIVE CONNECTION WITH WESTERN UNION CABLE SERVICE

CANADIAN NATIONAL TELEGRAPHS

J R WHITE GENERAL MANAGER
TORONTO

STANDARD TIME

COMMISSIONER OF PATENTS
OTTAWA
52

MOA088 16=DS MONTREAL QUE 19 840A=
COMMISSIONER OF PATENTS=
271 :CDN BLDG OTTAWA=

:CLIENT STILL ANXIOUSLY INQUIRING FOR ACTION APPLICATION FOUR SIX EIGHT SEVEN SEVEN SIX KINDLY ADVISE IMMEDIATELY=
:MARION AND MARION=

IN CONNECTION WITH WESTERN UNION CABLE SERVICE
EXCLUSIVE AVEC WESTERN UNION CABLE SERVICE

FORM 6102 E

CANADIAN NATIONAL TELEGRAPHS

W. M. ARMSTRONG
GENERAL MANAGER — GÉRANT GÉNÉRAL
TORONTO

CLASS OF SERVICE DESIRED GENRE DE SERVICE	
FULL RATE PLEIN TARIF	
DAY LETTER LETTRE DE JOUR	
NIGHT MESSAGE DÉPÊCHE DE NUIT	
NIGHT LETTER LETTRE DE NUIT	

PLACE X OPPOSITE SERVICE DESIRED
INDIQUEZ PAR UN X LE GENRE DE SERVICE DÉSIRÉ

CHECK	RECEIVERS NO.	TIME FILED	CHARGE TO DEPT OR ADDRESS

Send the following message, subject to the terms on back hereof, which are hereby agreed to
Veuillez expédier la dépêche suivante aux conditions mentionnées au verso auxquelles je consens par les présentes

The Patent Office,
Ottowa, Ontario.
May 19, 1952.

Messrs. Marion & Marion,
Box 368, Station "H",
Montreal, Quebec.

RE APPLICATION FOUR SIX EIGHT SEVEN SEVEN SIX ACTION MAY BE

EXPECTED WITHIN WEEK

I. C. Whillans
Acting Commissioner of Patents.

COLLECT.

IS YOUR MESSAGE COMPLETE? EXTRA WORDS COST ONLY A FEW CENTS.
VOTRE MESSAGE EST-IL CLAIR ET COMPLET? LES MOTS SUPPLÉMENTAIRES COÛTENT À PEINE QUELQUES CENTS.

Canadian File Wrapper 2 App. 367

Elie Agnnides, Esq.

per:

Messrs. Marion & Marion,
Box 368, Station "B",
MONTREAL, Quebec.

Patent Office
CANADA

Ottawa, JUN 4 1952

Please find below a communication from the Examiner in charge of your application, Serial No. 468,776 ***for***

"DEVICE FOR INTIMATELY MIXING AIR WITH WATER FLOWING UNDER PRESSURE"

Any communication respecting this application should give the serial number and should be addressed to "The Commissioner of Patents, Ottawa."

J. W. McHugh
Commissioner

Applicant's letter of May 4, 1951, has been carefully considered.

Present claims 1 to 5 inclusive, correspond to the claims of Applicant's United States Patent No. 2,210,846, which bears a filing date of December 31, 1937.

In view of the requirements of Section 27(1) of the Patent Act, the Applicant is not entitled to priority with regard to Holland and Swedish applications of 1939. Reading from Section 27(1), the Act states that an inventor may claim convention rights "--- provided the application in this country is filed within twelve months from the earliest date on which any such application was filed in such other country ---". This has not been the case in the present instance, and hence, the Applicant is not entitled to the priority date as claimed herein.

Referring to the previous Official Action of November 8, 1950: attention is directed to paragraph 2, re the status of the corresponding Belgium case. This information was not supplied in the response of May 4, 1951, and is again requested.

Division in accordance with Section 37(2) of the Act, is required between claims 1 to 5 inclusive on the one hand, and claims 6 to 9 inclusive, on the other. Claims 6 to 9 submit an improvement on the original device, said improvement being considered a second invention. Further, at present both groups of claims are not covered by a proper broad claim as required by Rule 70 of the Patent Rules, 1948.

Revision is required.

DIVISION 7.

AP

30M—5-51

2 App. 368 Canadian File Wrapper

430112

MARION & MARION
(ESTABLISHED 1892)
PATENT ATTORNEYS

SOLLICITEURS DE BREVETS
D'INVENTION.

RAYMOND A. ROBIC
J ALFRED BASTIEN

CASIER NO
P. O. BOX 368 STA. "B"

MONTREAL, 2, ... 195

IN THE CANADIAN PATENT OFFICE

In the matter of the application of)
ELIE AGHNIDES)
For a patent upon an improvement in)
"DEVICE FOR INTIMATELY MIXING AIR WITH) A M E N D M E N T
WATER FLOWING UNDER PRESSURE")
Filed Nov.15,1939;Ser.No.468,776)

HON. COMMISSIONER OF PATENTS,
OTTAWA, ONT.

S I R :

In answer to Official Action dated June 5th, 1952 please find enclosed herewith a new preamble in which the title reads "FLUID MIXING DEVICE" and new pages 1 and 4 in duplicate.

Please also delete page 6 of the description, Figures 8 and 9 of the drawings and claims 6, 7, 8 and 9.

- R E M A R K S -

The subject matter relating to Figures 8 and 9 is now cancelled from the present application as it has been filed in divisional application Serial No. 637,830 on October 9th, 1952 in accordance with the division requirement of the Examiner.

Canadian File Wrapper 2 App. 369
490112

Applicant hereby abandons the priority dates of the Dutch and Swedish applications of June 22nd, and June 26th, 1939 respectively.

The Belgian case filed December 8th, 1934 has been granted on January 31st, 1935 as Belgian Patent No. 406,702.

Belgian Patent No. 406,702 does not describe the bubbly stream as disclosed in the present case and consequently cannot be opposed to the present application.

The present case is believed to fully meet the requirements of Section 26 of the Patent Act, 1935.

The foreign cases corresponding to the present application are as follows:

U.S. Patent No. 2,211,846 issued Aug. 6th, 1940
Dutch Patent Application filed June 22nd, 1939
Swedish " " " June 26th, 1939
British Patent No. 625,084 issued Sept. 6th, 1949

The actual or eventual issue dates of these cases are all posterior to Applicant's filing date of November 15th, 1939.

The present application is consequently believed in condition for allowance.

A favourable action is accordingly solicited.

Respectfully submitted,

ELIE AGHAIDES

By: Marion & Marion

Attorneys

Encl.
October 29th, 1952
MONTREAL, CANADA
EL/DJ

TO ALL WHOM IT MAY CONCERN :

Be it known that I, Elie A[illegible]nides, a citizen of the Greek Republic and resident of Brussels, Belgium, have invented certain new and useful Improvements in and relating to devices for intimately mixing air with water flowing under pressure, of which the following is a specification :

This invention relates to apparatus for the intimate mixture of the ambient air with water flowing under pressure, and consisting of an upper part forming injector for the intake of the air by the water under pressure, and an outlet, and comprising between this outlet and the injector a dividing mixer through which the two fluids water and air are forced to pass. According to the purpose of the invention, such apparatus are essentially meant to be fitted at the outlet of a tap for the distribution of the town's water supply.

In certain known contrivances of this type, the dividing mixer is made up of projections, baffles, stops, or other radial devices, or otherwise disposed, on which the jets of both fluids come to be broken up so as to determine a more or less intimate intermixture of both fluids. In these devices, the jet leaving the apparatus has no conesion, it is exactly like an ordinary water jet in appearance, the air which is carried escaping immediatly at the outlet.

In other known apparatus, the dividing mixer consists of a plate with relatively large perforations, which gives the same result as that obtained by means of projections or of baffles.

Further, a device of this type is known in which the divider is formed by at least one plate with extremely fine holes, of a capillary character ; these holes which are very tiny, determine according to the characteristic features of this apparatus, a real

quantity of air carried away decreases, and the apparatus loses some of its interest.

The third condition aims at obtaining a coherent well and plain jet, in which the air bubbles are imprisonned in the jet ; it equally aims at decreasing the resistance offered by the mixing means.

These three essential conditions can give birth to quite a series of interesting embodiments, either applied by themselves, or in combination with other constructive characteristics, as will be brought out in the following description made with reference to the annexed drawings, in which :

Fig.1 is an axial section of a first embodiment.

Fig.2 is the same section of a variant.

Fig.3 is a section according to III-III of fig.2 ;

Fig.4 is a section of another variant,

Fig.5 is a section or still another variant,

Fig.6 is a section of a variant to be connected with a flexible.

Fig.7 is a section according to VII-vII of fig.6.

Figs,8 and 9 are section of two other variants.

Refering to Fig.1, 1 designates an ordinary household tap, and 2 is a connection for the tap ; this connection is of known construction, 4 is the body of the mixing-divider. The perforated plate 6 allows the water to pass into the chamber 4 in the form of a large number of little jets. A series of passages 8 are provided for the admission of the external air into the chamber 4, through the action of the jets coming out of 6. 10 designates a screen or sieve at the lower part of the body 4, above a narrowed outlet 12. The screen 10 consists of a sieve with passages, the section of which corresponds with that of a circle the diameter of which is included between 0,05 mm. and 2,5 mm., and which answers to the three essential conditions previously indicated. The contraction 12 at the outlet also offers

On Fig.8, the envelope 31, provided with lateral holes for the admission of air is screwed by means of its adge 32 on to a metallic connection 33 which is itself screwed on to the extremity of the tap 34. The three sieves 39 simply superposed or separated by means of rings 40, are surmounted by a ring 43 provided with notches 44 for the passage of the external air admitted through the holes of the envelope 31 ; on this ring 43 is placed the perforated plate 35. By the screwing up of the part 31, the assembly of the sieves 39, rings 40 and the ring 43 is tightened up and properly immobilised, as is shown in the drawing. This assembly allows an easy removal of the sieves for cleaning purposes. A characteristic feature of this variant is also the contraction of the water passage, in the connector 33, above the plate 35. This contraction has as object the concentration of the water column towards the axis, so as to obtain a greater velocity at the centre when leaving the plate 35, so as to render the repartition of the air sucked in more uniform over the whole section of the jet before its arrival at the divider 39.

The variant shown in Fig.9 is still provided with this contraction combined with a perforated plate 36 above the plate 35. The part played by this plate 36 is whilst retaining the effect of the contraction 37, to better distribute the water over the section of the chamber 31. This second plate 36 can furthermore be applied to the examples shown in Figs. 1 and 4 for instance without the contraction 37. In this example, the divider consists of three sieves 41 which are superposed, caught in a ring 42. One will understand that, in the case of several sieves, either superposed or spaced, these may, in one embodiment or the other, be mounted in a common ring so as to form a removable unit.

6. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a foraminous member upstream the apertured diaphragm.

7. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice upstream the apertured diaphragm.

8. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, an apertured diaphragm at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragm and means in the path of the water after it leaves the apertured diaphragm and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles and a restricted orifice and foraminous member upstream the apertured diaphragm.

9. A device for producing a jet of water containing air bubbles comprising a chamber the inlet end of which is adapted for connection with the discharge end of a faucet or the like and the outlet end of which is adapted to discharge said jet, superposed apertured diaphragms at the upstream end of the chamber through which water is adapted to be forced into the chamber with substantial velocity, an air port opening into the chamber through which air is induced by the water delivered from the apertured diaphragms and means in the path of the stream of water after it leaves the apertured diaphragms and before it discharges at the outlet end for finely breaking up the water and mixing it with air to form a coherent jet having bubbles.

'468 176
12

Fig.8

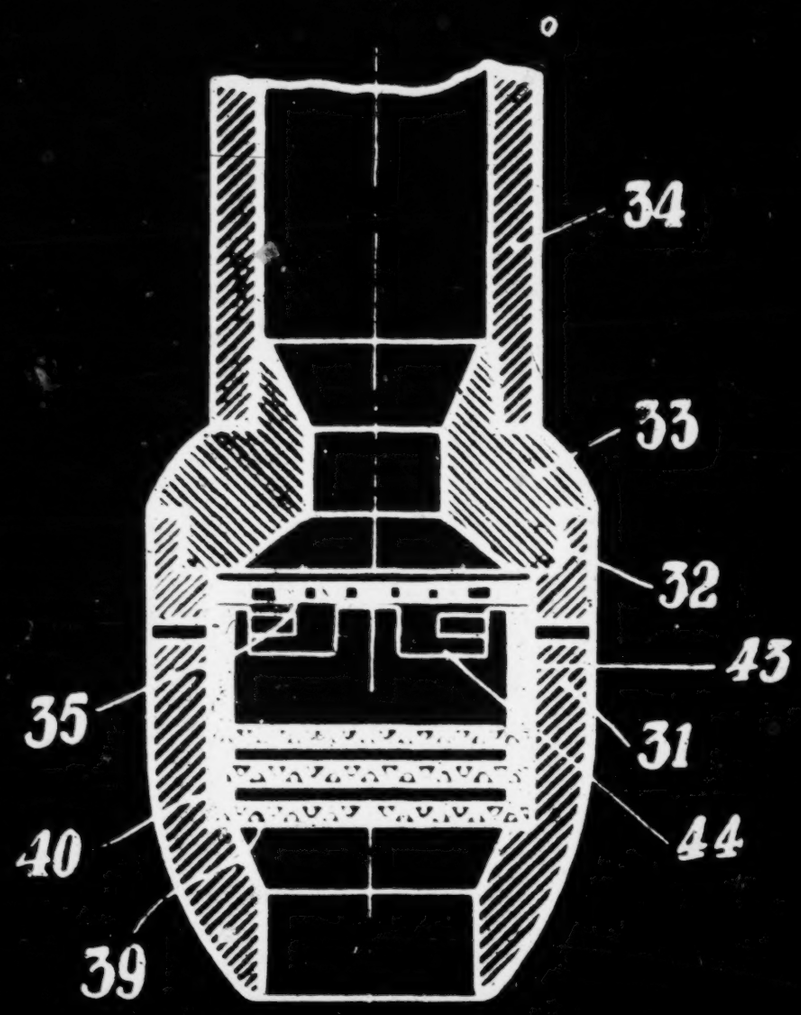
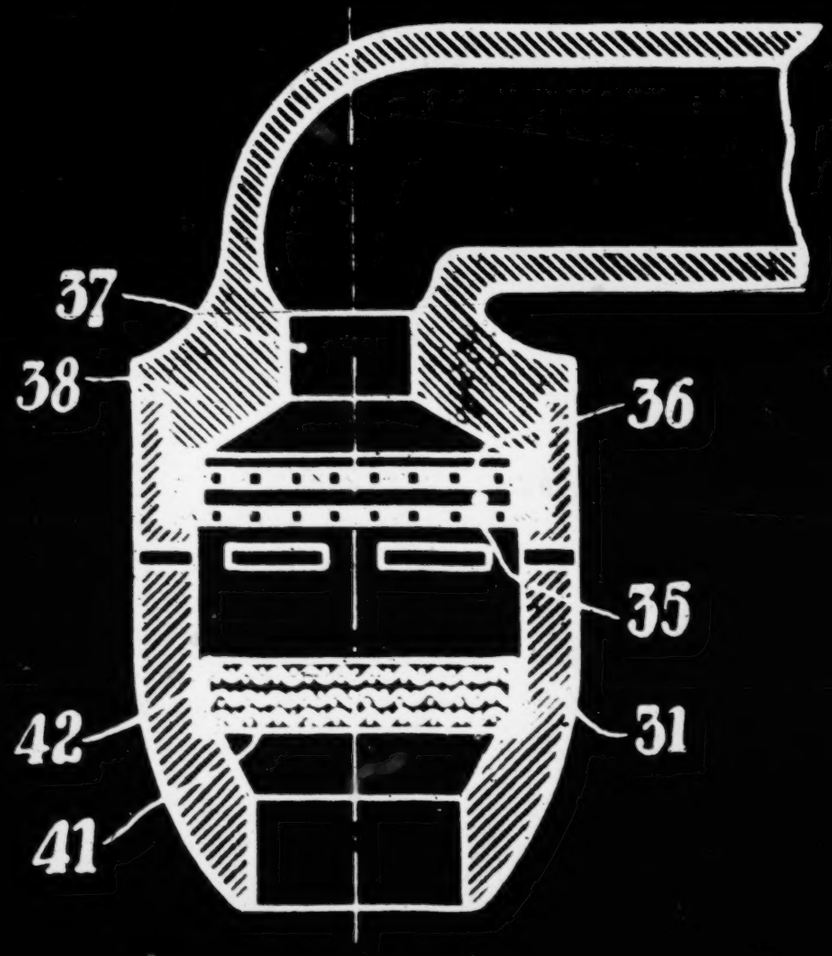


Fig.9



Witnesses :

Certified to be the drawings referred
to in the specification hereunto annexed.
Signed at MONTREAL, Can. Nov. 14, 1939.

Inventor
Elie AGHNIDES

By Marion & Marion
Attorneys

2 App. 376 Canadian File Wrapper

490112

PATENT AND COPYRIGHT OFFICE

COMMUNICATIONS SHOULD BE ADDRESSED
"THE COMMISSIONER OF PATENTS"
"OTTAWA"

WHEN PAYMENT OF FINAL FEE IS MADE THE APPLICATION SHOULD BE FULLY IDENTIFIED AND THE DATE OF ALLOWANCE MUST BE GIVEN.

CANADA

PATENT OFFICE

OTTAWA, December 2, 1952.

OTTAWA CANADA
PATENT OFFICE
7001

NOTICE OF ALLOWANCE

Serial No. 468,776

Inventor Elie Aghnides

Title Fluid Mixing Device

The above application for patent has been allowed.

The final fee, TWENTY-FIVE DOLLARS, must be paid not later than six months from the date of this notice.

The patent will issue in accordance with the provisions of Rule 90 of The Patent Rules, 1948.

Commissioner

To Messrs. Marion & Marion,
Box 368, Station "A",
Montreal, Que.

Circular No. 12
20M—7-52

Canadian File Wrapper 2 App. 377

MARION & MARION
(ESTABLISHED 1892)
PATENT ATTORNEYS

SOLLICITEURS DE BREVETS
D'INVENTION

RAYMOND A. ROBIC
J. ALFRED BASTIEN

CASIER No 368 STATION "H"
P. O. Box
MONTREAL 25, December 8, 1952

THE COMMISSIONER OF PATENTS,
O T T A W A,
Ont.

S I R,

Re: Elie Agnnides, Can. Pat. Appl. No. 466.776.

Attached herewith please find the sum of $25.00 (twenty-five dollars), covering the final fee for this application, which was allowed on December 2nd, 1952.

Yours truly,

Marion & Marion, Attorneys

per: E. A. Bastien

JAB/amg
Encl.

Canadian File Wrapper 2 App. 379

PATENT AND COPYRIGHT OFFICE

COMMUNICATIONS SHOULD BE ADDRESSED
"THE COMMISSIONER OF PATENTS"
"OTTAWA"

WHEN WRITING ON THIS SUBJECT REFER TO
SERIAL NUMBER OF APPLICATION

CANADA

PATENT OFFICE

OTTAWA, Dec. 11, 1952

Application Serial No. 468,776

Applicant Elie Aghnides

Gentlemen:

I have the honour to acknowledge the receipt of the final fee in the above application and to advise that the patent will issue under date Feb. 3, 1953.

Your obedient servant,

J. W. McIlwraith

To Messrs. Marion & Marion,
Box 368, Station "H",
Montreal, Quebec.

2 App. 380 Canadian File Wrapper

PATENT OFFICE

APPLICATION FOR PATENT

No. 468776 FILED Nov. 15, 1939

PATENT

No. 490112

DATE FEB3-1953

FEES RECEIVED

FILING FEE $ 15.00

ADDITIONAL CLAIMS $

REINSTATEMENT FEE $

RESTORATION FEE $

FINAL FEE $ 25.00

ASSIGNMENT FEES | ASSIGNMENTS RECORDED

(1) $

(2) $

(3) $

CARDBOARD DRAWINGS | CONVENTION PET'N OATH COPY

APPLICANT

Elie Aghnides

ATTORNEY

Marion & Marion
Box 368 Station
Montreal, Que.

INVENTION

~~Device for Intimately Mixing Air with Water Flowing under Pressure~~
Fluid Mixing Device

ACTION

Acknowledged by Circular I, and receipt mailed Nov. 22 1939

New oath called for - Lic 2 - Nov. 25/39, Lt. new oath & appt May 9/10/47. Lt. May 16/17/47. Ackd - dupl papers rtd case abandoned. May 30/47. Lt. June 16/17/47 Exn time to complete papers (E.O.) Aug. 26/47 LET DUPL & AWD'T. Sept. 5/6/47 Lt. Oct. 12/12/49 REP'T. & DUP'L. MLD. NOV 8 1950 Lt. dupl May 4/5/51. Telegram May 19/52 Ackd May 19/52 REP'T. MLD. JUN 4 1952 Lt. Amdt. [illegible] Oct. 28/28/52 Lt. + 25.00 Dec 8/9/52 ACK'D. DEC 1 1 19[illegible]

DEC 2

PATENT

FEB3-1953

COST OF COPIES

PATENT	$	PETITION	$
SPECIFICATION		OATH	
DRAWING		CORRES., ETC.	
CLAIMS		RECORD FILE	1475

2 App. 385
490112

Canadian Patent

Fig.1

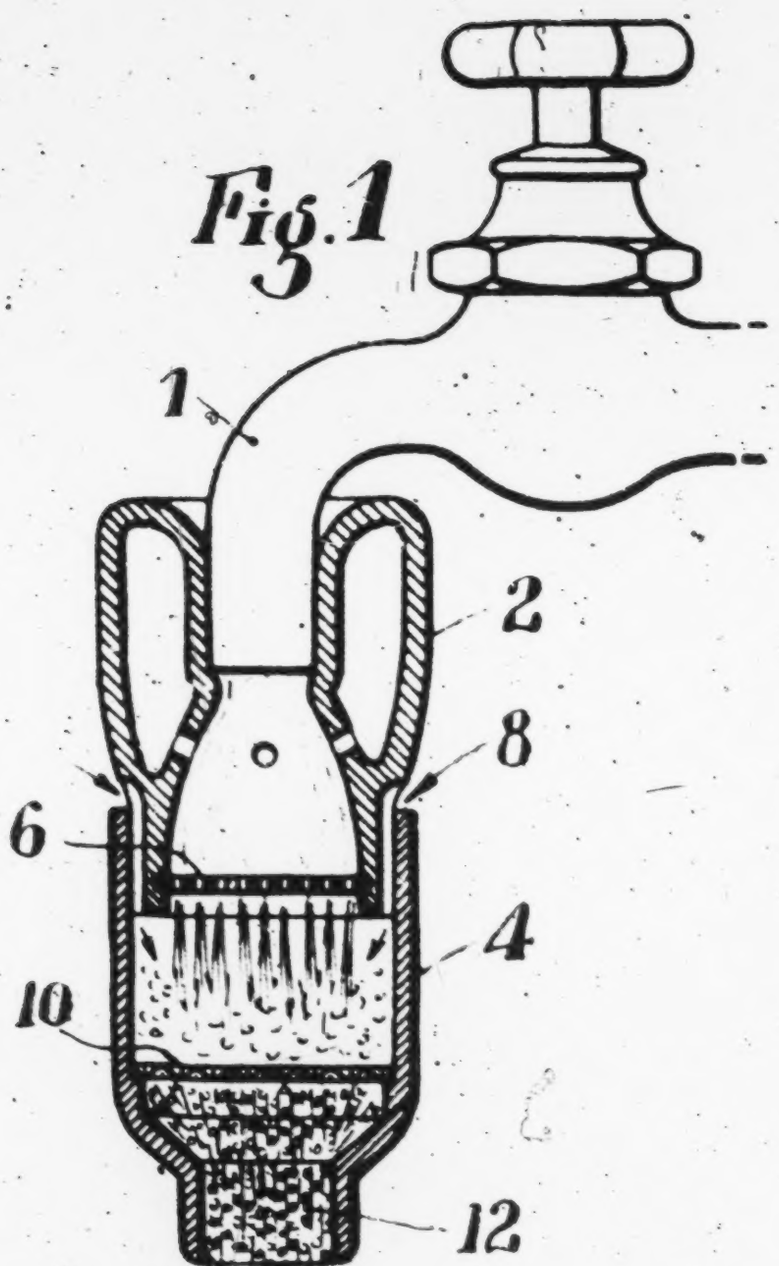


Fig.4

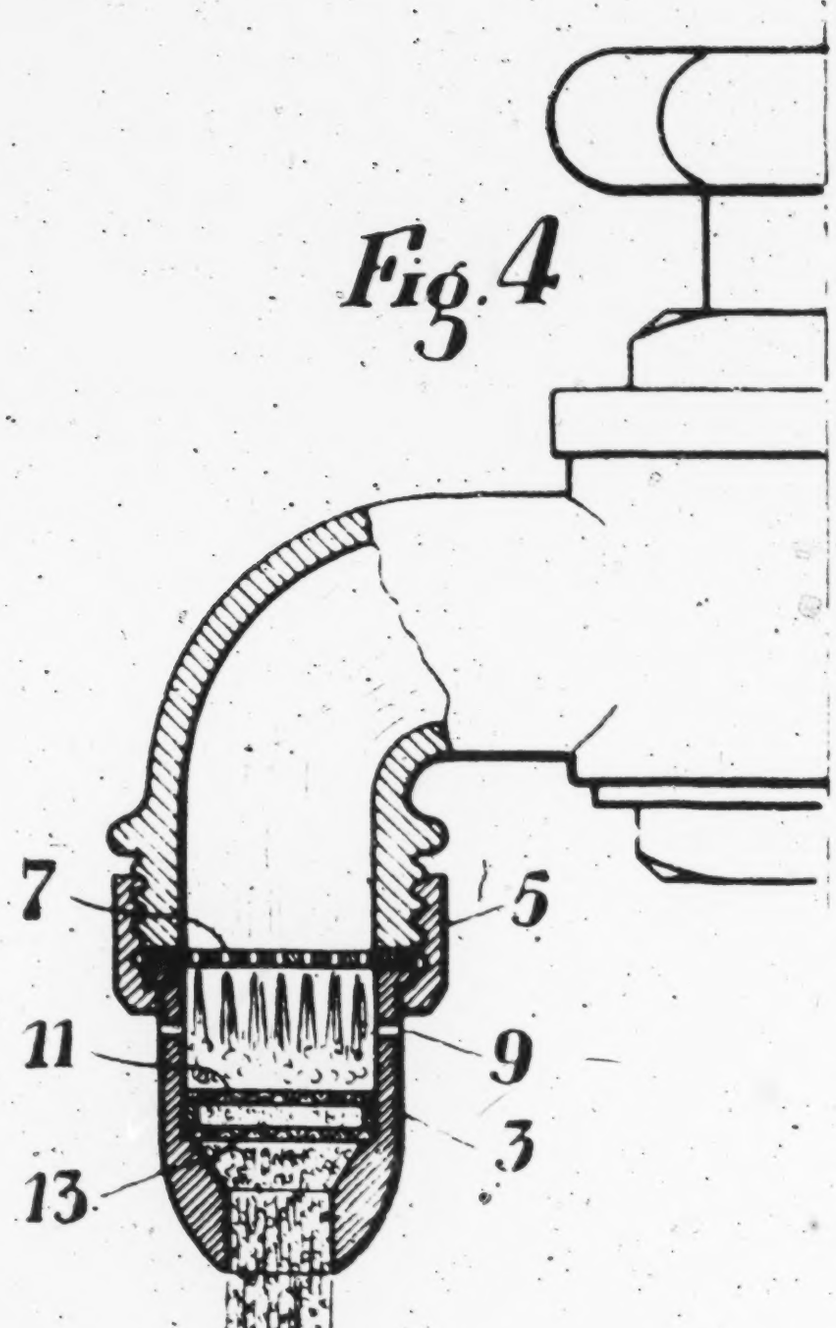


Fig.2

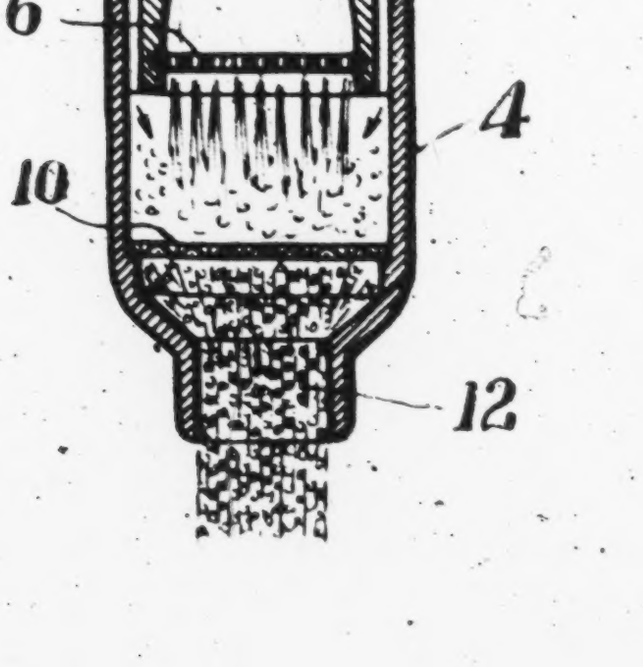


Fig.5

Fig.6

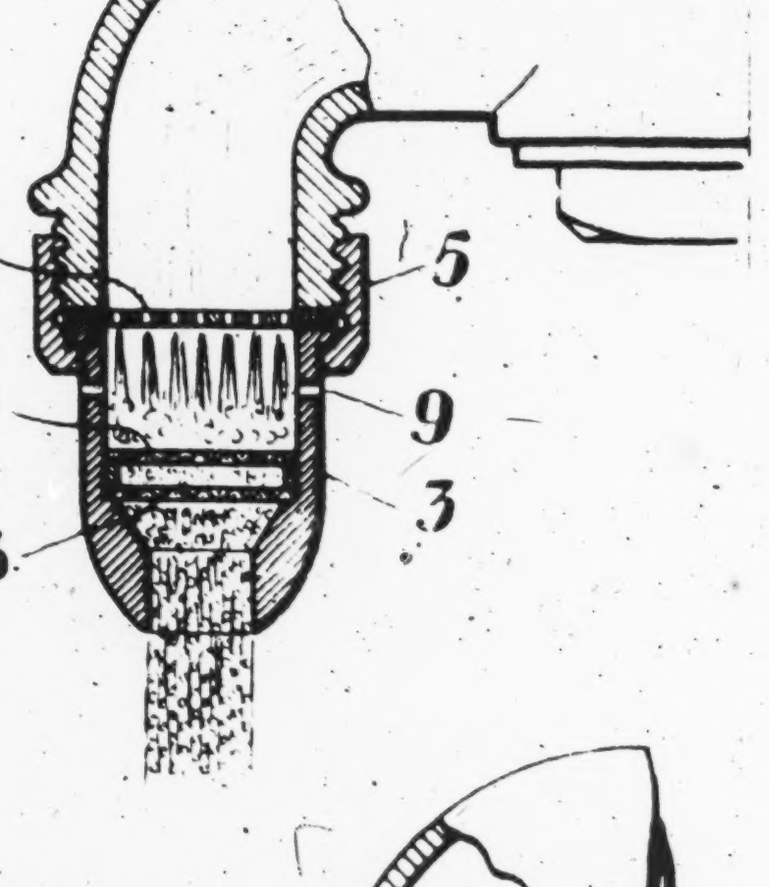
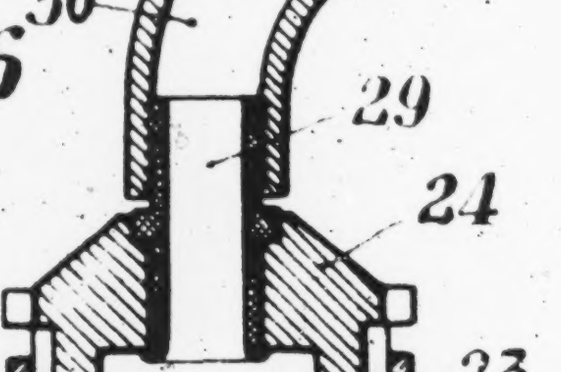


Fig.3

Fig.7



Inventor

Elie AGHNIDES

Ulmaxica

Dutch Patent 2 App. 387

Uitgegeven 15 Maart 1950.
Dagtekening 16 Februari 1950.

C. D. 615.838.5

Auteursrecht voorbehouden.

OCTROOIRAAD

NEDERLAND

OCTROOI No. 65293.

APR 4 1950

KLASSE 12 c 4 c (101 cs 4).

U. S. PATENT OFFICE ELIE AGHNIDES, te Brussel.

Straalstuk.

Aanvrage No. 93976 Ned., ingediend 22 Juni 1939, 14 uur 45 min; openbaar gemaakt 15 October 1949, voorrang van 22 Juni 1938 af voor conclusie 1, (Groot-Brittannië).

De uitvinding heeft betrekking op een straalstuk met een deel, dat een injecteur vormt en waardoorheen water kan stromen door een geperforeerd diaphragma, na welk diaphragma luchtaanzuigopeningen zijn aangebracht en met een uitlaatopening en een enkel- of meervoudig verdeel- en menglichaam tussen deze uitlaatopening en de luchtaanzuigopeningen.

Uit het Franse Octrooischrift 800.069 is een straalstuk van deze soort bekend, waarmede volgens deze publicatie lucht zeer fijn in de waterstraal wordt verdeeld, zodat een emulsie ontstaat en de straal niet schuimt.

Volgens de uitvinding zijn in het verdeel- en menglichaam doorstroomkanalen aanwezig voor het mengsel van water en lucht, die een middellijn van ongeveer 0,05 à 2,5 mm en een totale maximum lengte van ongeveer 30 maal deze middellijn hebben, alsmede een onderlinge afstand, die een onmiddellijke vereniging van de uit het verdeel- en menglichaam tredende afzonderlijke stralen en het insluiten van de meegesleurde lucht verzekert, en heeft voor een gegeven verdeel- en menglichaam de verhouding tussen de afstand van het diaphragma tot het verdeel- en menglichaam en de nuttige middellijn van het verdeel- en menglichaam een waarde, die kleiner is dan 1,4.

Bij deze uitvoering van het straalstuk zal de uittredende straal een grote hoeveelheid lucht bevatten in de vorm van bellen, die de schuimstraal sneeuwwit maken en ontwijken, zodra de straal in een vat wordt opgevangen. De straal kan 30 à 40 volumeprocenten lucht bevatten.

Het aan de bovenstaande eisen beantwoordende verdeellichaam kan op zeer uiteenlopende wijzen worden verkregen, hetgeen in het onderstaande aan de hand van de tekening zal worden toegelicht. In de tekening tonen:

fig. 1 en 2 axiale doorsneden van twee verschillende uitvoeringen van het straalstuk,

fig. 3 een dwarsdoorsnede volgens de lijn III—III in fig. 2,

fig. 4 een axiale doorsnede van een derde uitvoeringsvorm,

fig. 5 een axiale doorsnede van een verdeellichaam volgens een gewijzigde uitvoering,

fig. 6 een langsdoorsnede van een straalstuk, hetwelk geschikt is om aan een buigzame slang te worden bevestigd,

fig. 7 een dwarsdoorsnede volgens de lijn VII—VII in fig. 6, en

fig. 8 en 9 axiale doorsneden van twee andere uitvoeringen.

In fig. 1 is een normale huiskraan 1 weergegeven, die van een aansluitstuk 2 is voorzien, waarop het straalstuk 4 is bevestigd. Het water stroomt door de geperforeerde plaat 6 in het straalstuk 4 in de vorm van een groot aantal kleine stralen. Aan de omtrek van het aansluitstuk 2 bevindt zich een reeks kanalen 8, waardoor in het straalstuk 4 lucht van buiten kan toetreden onder de werking van de uit de openingen 6 komende waterstralen. In het benedendeel van het straalstuk 4 bevindt zich boven een vernauwde uitstroomopening 12 een zeefplaat 10. De mazen van deze zeefplaat 10 komen in doorsnede overeen met een cirkel, waarvan de middellijn tussen 0,05 en 2,5 mm is gelegen. De vernauwing 12 van de uitstroomopening bevordert het uitstromen in een regelmatige straal.

Bij de uitvoeringsvorm volgens fig. 2 en 3 is op de kraan 1 een metalen huls 14 geschroefd, die het geperforeerde diaphragma 16 tegen de uitstroomopening van de kraan vastklemt en die een verdeellichaam bevat, hetwelk bestaat uit drie op enige afstand of onmiddellijk boven elkander gelegen zeefplaten 18. Het dia-

Verkrijgbaar bij het Bureau voor de Industriële Eigendom, te 's-Gravenhage.
Prijs per ex. f 1.—.

phragma 16 heeft bij deze uitvoering slechts één centrale opening, en de huls 14 heeft hier eveneens een vernauwde uitstroommonding.

Bij de uitvoering volgens fig. 4 is de huls 3 voorzien van een aansluitstuk 5, met behulp waarvan zij op een gewone waterkraan kan worden bevestigd. Het geperforeerde diaphragma 7 is tussen de huls 3 en het benedeneinde van de kraan vastgeklemd en de lucht treedt toe door een reeks openingen 9. Het verdeellichaam bestaat hier uit twee boven elkander gelegen zeefplaten 11, 13.

De uitvoeringsvorm volgens fig. 5 heeft een geperforeerd diaphragma 16, waarvan de openingen zich aan de omtrek bevinden. De huls 17 is bij deze uitvoering voorzien van inwendige uitsteeksels 19. Het hoofddeel van de uit de openingen van het diaphragma tredende waterstralen stoot tegen de uitsteeksels 19 om te worden gebroken en is reeds met de door de openingen 21 aangezogen lucht gemengd, voordat het water het verdeellichaam bereikt. Dit verdeellichaam wordt hier gevormd door twee in het vernauwde deel 22 van de huls 17 gelegen zeefplaten.

Bij de uitvoeringsvorm volgens fig. 6 en 7 is het diaphragma 23, dat één enkele centrale opening, of openingen aan de omtrek of gelijkmatig verdeelde openingen kan hebben, aangebracht in een groef van een rubber aansluitstuk 24, waarvan het cylindrische buitenvlak voorzien is van langsgroeven 25 voor het toetreden van lucht. De huls 26 is op het aansluitstuk 24 geschoven en bevat drie op afstand gelegen zeefplaten 27 en heeft een vernauwde uitstroomopening 28. In het hart van het aansluitstuk 24 is een buisstuk 29 onwrikbaar bevestigd, waarop een buigzame slang 30 kan worden aangesloten, die met een bron voor water onder druk kan worden verbonden.

Bij de uitvoering volgens fig. 8 is het straalstuk 31 aan de rand 32 voorzien van zijdelingse openingen voor het toetreden van lucht. Dit straalstuk wordt geschroefd op een metalen aansluitstuk 33, hetwelk op zijn beurt op het einde van een kraan 34 is geschroefd. Het geperforeerde diaphragma 35 is tussen het aansluitstuk 33 en het straalstuk 32 vastgeklemd. Het verdeellichaam bestaat uit drie zeefplaten 39, die door ringen 40 van elkander zijn gescheiden. Bij deze uitvoering heeft het kanaal van het aansluitstuk 33 een vernauwing boven het diaphragma 35, welke ten doel heeft, de waterstraal in de as van het kanaal te concentreren ten einde na het passeren van het diaphragma 35 een grotere snelheid in het midden te verkrijgen, opdat de verdeling van de aangezogen lucht over de gehele doorsnede van de straal vóór het bereiken van het verdeellichaam 39 gelijkmatiger wordt.

De uitvoering volgens fig. 9 heeft eveneens een vernauwing 37 en onder deze vernauwing een extra geperforeerde plaat 36, die boven het diaphragma 35 is gelegen. De plaat 36 heeft ten doel, met behoud van de werking van de vernauwing 37 het water beter over het straalstuk 31 te verdelen. De extra plaat 36 kan ook worden toegepast bij de uitvoeringsvormen volgens fig. 1 en 4, bijvoorbeeld zonder aanwezigheid van de vernauwing 37. Bij de uitvoering volgens fig. 9 bestaat het verdeellichaam uit drie boven elkander gelegen zeefplaten 41, die in een ring 42 zijn gevat.

Conclusies.

1. Straalstuk met een deel, dat een injecteur vormt en waardoorheen water kan stromen door een geperforeerd diaphragma, na welk diaphragma luchtaanzuigopeningen zijn aangebracht en met een uitlaatopening en een enkel- of meervoudig verdeel- en menglichaam tussen deze uitlaatopening en de luchtaanzuigopeningen, met het kenmerk, dat in het verdeel- en menglichaam (10, 11 en 13, 18, 27, 39, 41) doorstroomkanalen aanwezig zijn voor het mengsel van water en lucht, die een middellijn van ongeveer 0,05 à 2,5 mm en een totale maximum lengte van ongeveer 30 maal deze middellijn hebben, alsmede een onderlinge afstand, die een onmiddellijke vereniging van de uit het verdeel- en menglichaam tredende afzonderlijke stralen en het insluiten van de meegesleurde lucht verzekert, en dat voor een gegeven verdeel- en menglichaam de verhouding tussen de afstand van het diaphragma (6, 7, 15, 16, 23, 35, 36) tot het verdeel- en menglichaam en de nuttige middellijn van het verdeel- en menglichaam een waarde heeft, die kleiner is dan 1,4.

2. Straalstuk volgens conclusie 1, met het kenmerk, dat stroomopwaarts van het diaphragma (23 of 35) een geperforeerd lichaam (36) en of een vernauwde doortochtsopening (29 of 37) is aangebracht.

Aanvrage No. 83076

Hierbij 1 blad tekeningen.

65293

Fig.1

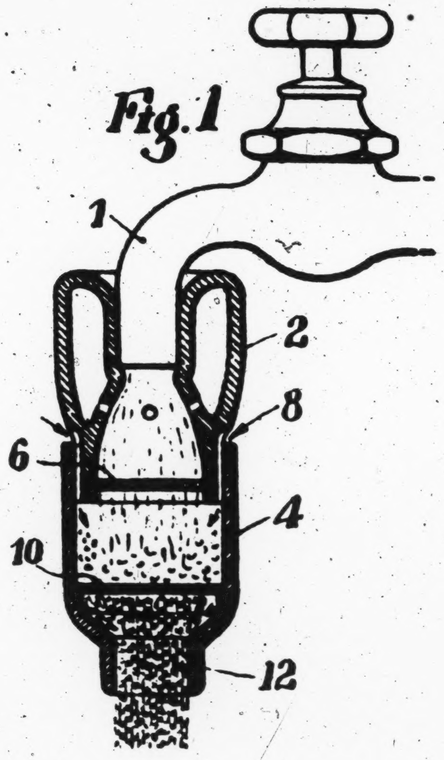


Fig.2

Fig.3

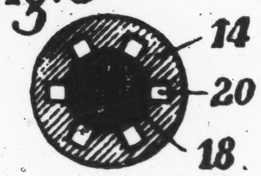


Fig.4

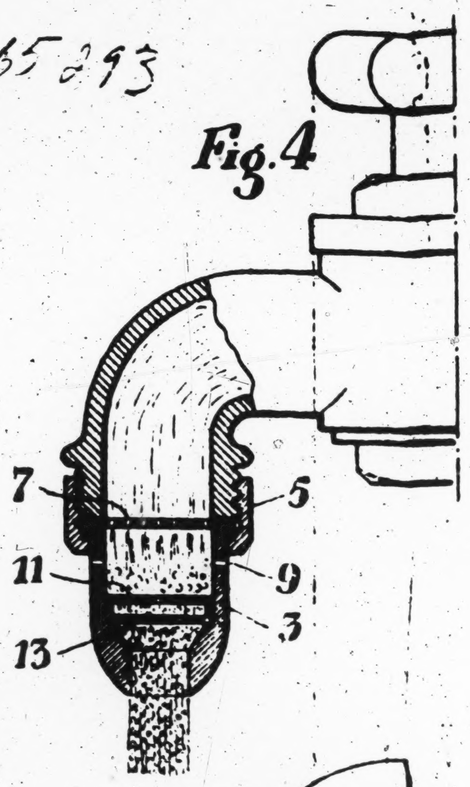


Fig.5

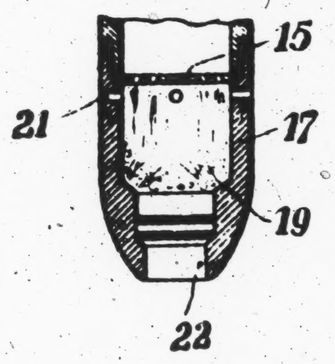


Fig.6

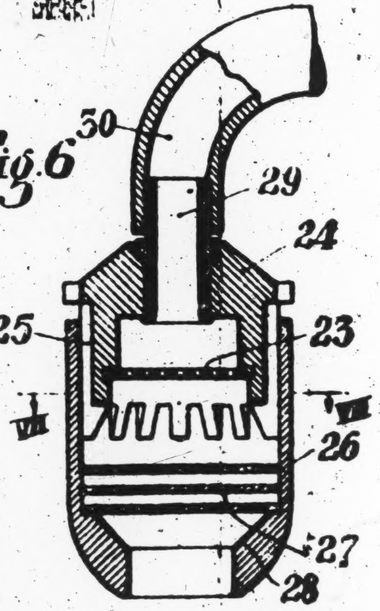


Fig.7

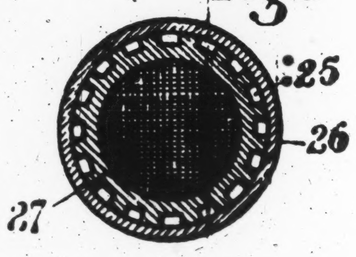


Fig.4

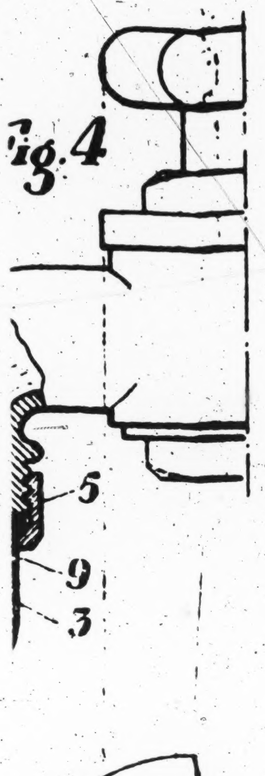


Fig.7

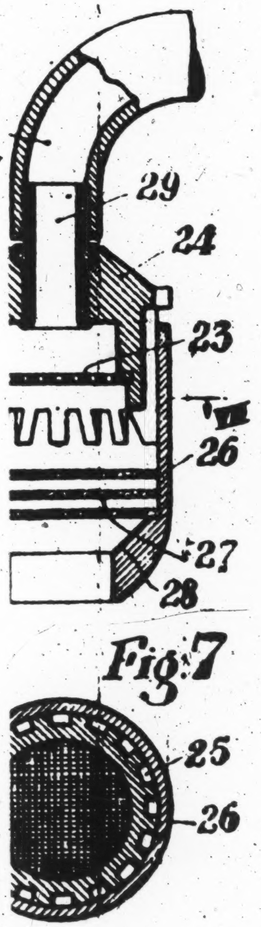


Fig.8

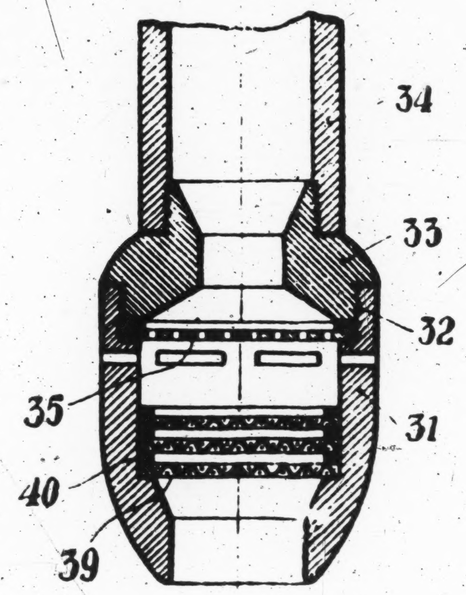
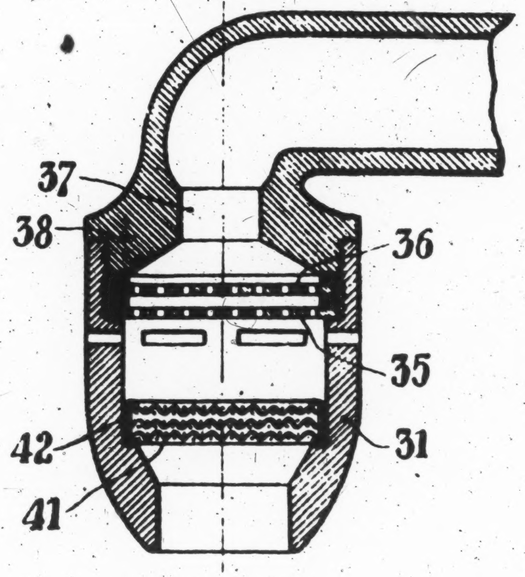



Fig.9